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The scientific publications of the National Museum include two series, known, respectively, as *Proceedings* and *Bulletin*.

The *Proceedings*, begun in 1878, is intended primarily as a medium for the publication of original papers, based on the collections of the National Museum, that set forth newly acquired facts in biology, anthropology, and geology, with descriptions of new forms and revisions of limited groups. Copies of each paper, in pamphlet form, are distributed as published to libraries and scientific organizations and to specialists and others interested in the different subjects. The dates at which these separate papers are published are recorded in the table of contents of each of the volumes.

The present volume is the seventy-first of this series.

The *Bulletin*, the first of which was issued in 1875, consists of a series of separate publications comprising monographs of large zoological groups and other general systematic treatises (occasionally in several volumes), faunal works, reports of expeditions, catalogues of type-specimens, special collections, and other material of similar nature. The majority of the volumes are octavo in size, but a quarto size has been adopted in a few instances in which large plates were regarded as indispensable. In the *Bulletin* series appear volumes under the heading *Contributions from the United States National Herbarium*, in octavo form, published by the National Museum since 1902, which contain papers relating to the botanical collections of the Museum.

ALEXANDER WETMORE,
Assistant Secretary, Smithsonian Institution.

WASHINGTON, D. C., April 13, 1928.

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THE BEETLES OF THE FAMILY CLERIDAE COLLECTED ON THE MULFORD BIOLOGICAL EXPLORATION OF THE AMAZON BASIN 1921-1922

BY

EDWARD A. CHAPIN
Associate Entomologist, United States Department of Agriculture

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THE BEETLES OF THE FAMILY CLERIDAE COLLECTED ON THE MULFORD BIOLOGICAL EXPLORATION OF THE AMAZON BASIN, 1921-1922

By Edward A. Chapin,
Associate Entomologist, United States Department of Agriculture

About two hundred specimens of beetles belonging to the family Cleridae were collected in the course of the field work of the Mulford expedition to the upper Amazon region, nearly all being taken by Dr. W. M. Mann, entomologist of the party. The route of the expedition is shown on the map (fig. 1), which has been adapted from that prepared and published by Dr. T. E. Snyder in his report on the termites. Most of the Cleridae came from two localities, Tumupasa (December, 1921) and Cavinas (January-February 1922). A few specimens were taken at the following places: Huachi (August-September, 1921), Rurrenabaque (October-December, 1921), Yvon (February, 1922), and Cachuela Esperanza (March, 1922).

The territory surveyed by the Mulford expedition lies to the west and adjoins that which was investigated by the Stanford expedition in 1911. The 12 species of Cleridae obtained by that expedition have been studied and reported on by A. B. Wolcott.[1] Some years before this, 12 species from the western Amazon region were described as new by A. Kuwert,[2] his material coming mainly through Doctor Staudinger. Twenty species belonging to eight genera are contained in the Mulford collection. These three collections contain no species of Tillinae, 1 genus with 1 species of Hydnocerinae, 1 genus with 6 species of Clerinae, no Thaneroclerinae, 5 genera with 20 species of Epiphloeinae, 2 genera with 3 species of Enopliinae, and 1 genus and species of Korynetinae, or a total of 10 genera and 31 species actually recorded from this region.

[1] Psyche, vol. 19, No. 3, pp. 71-77, pls. 6-7, 1912.
[2] Ann. Soc. Ent. Belg., vol. 37, pp. 492-497, 1893; vol. 38, pp. 6-13, 1894.

Subfamily CLERINAE

Genus ENOCLERUS Gahan, 1910.

1. ENOCLERUS DICHROUS, new species

Somewhat resembling *E. bellus* (Schenkling). Head castaneous, the vertex and mandibles piceous. Rest of mouth parts, legs, and under parts of thorax dark castaneous. Pronotum testaceous with pinkish reflections except for a transverse blotch of piceous at the middle of the anterior margin. Scutellum black. Elytra pinkish testaceous with violaceous markings. Head finely and sparsely punctured except for a median vertical impunctate area. Vestiture short and sparse with a few longer erect black hairs intermingled. Pronotum slightly broader than long (34–38), punctures sparse and extremely fine except near anterior margin, anterior transverse impression broad and shallow, vestiture similar to that of head. Punctation of elytra similar to that of pronotum. Elytra pinkish testaceous, each with two large spots of violaceous blue. The anterior spot is quadrate, is two-fifths as long as the elytron and includes the suture, basal margin and humeral callus. The posterior spot conforms in shape to the apical half of the elytron; its anterior margin is straight and transverse and lies at the exact middle of the length of the elytron. The spot fails narrowly to include the suture, more widely the lateral margin. Under parts sparsely pubescent, the abdomen reddish testaceous. Length: 6–7mm. Locality: Tumupasa.

Type and five paratypes.—Cat. No. 29355, U.S.N.M.

One of the paratypes has attained the full coloration of the type, the rest lack the violaceous markings on the elytra.

2. ENOCLERUS INIMICOIDES, new species

Color and markings much as in *E. inimicus* Wolcott. Head, thorax, abdomen and appendages (mostly) black, elytra violaceous with testaceous markings. Head with eyes slightly narrower than the pronotum, finely and densely punctured except for a small median smooth space at the level of the insertions of the antennae. Vestiture of dense gray pile with a few longer erect black hairs. Antennae nearly as long as pronotum, first segment bent and pale beneath, ninth and tenth together equal in length to eleventh. Pronotum slightly broader than long (45–48), finely and densely punctured. Vestiture dense, that of the disk black, that of the anterior portion of the flanks and the anterior transverse impression gray; there are a few gray hairs along the posterior margin. Elytra with punctures which are for the most part much finer than those of the pronotum but which are set with equal density. There are a few erect black hairs on both pronotum and elytra. Scutellum black. Elytra violaceous except for an oblique band of testaceous, equal in width

throughout its length, running from in front of the humeral callus to the suture. A second band, likewise testaceous, parallel to the first, commences just behind the humeral callus as a fine line which widens rapidly as it approaches the suture, where it is twice as wide as the first. At the middle of the length of the elytron there is a third

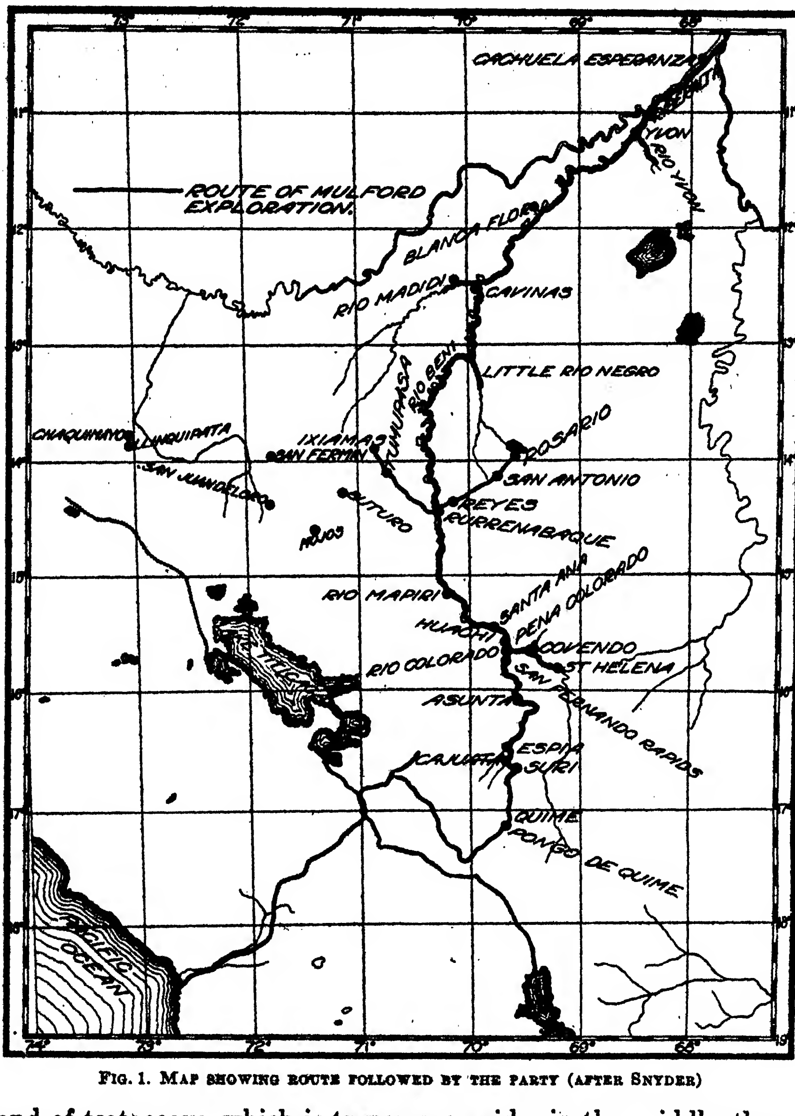

FIG. 1. MAP SHOWING ROUTE FOLLOWED BY THE PARTY (AFTER SNYDER)

band of testaceous which is transverse, wider in the middle than at its extremities, its posterior margin straight, its anterior margin strongly arcuate. The sutural extremities of these bands are connected by a narrow stripe of testaceous which does not involve the sutural bead. There is also a subapical band which is oblique in the

direction opposite to that of the first and second. It is of equal width throughout its length and connects the sutural and marginal beads. Vestiture fine, not as dense as on the pronotum, black in front of and gray behind the subapical band. Underparts densely clothed with gray hairs. Length: 8.5 mm. Locality: Rurrenabaque.

Type.—Cat. No. 29356, U.S.N.M.

Compared with a paratype of *E. inimicus* Wolcott the present species is much larger, its thorax is broader than long instead of the reverse, the palpi are dark instead of light, the second oblique band is not of equal width throughout and the subapical band is of equal width throughout its length.

In the original description of *E. inimicus*, the thorax is said to be broader than long. Measurements of a paratype give the ratio of length to breadth as 38–35.

3. ENOCLERUS FLAVIBASIS, new

Somewhat similar to *E. laticinctus* (White). Black, elytra with basal half except the scutellar region testaceous, scutellar region and apical half violaceous black. Head finely and rather densely punctured, punctures near frontal margin slightly more coarse, front with two shallow impressions. Vestiture sparse, mostly gray. Antennae much shorter than the pronotum, black; first segment pale beneath, last segment very slightly longer than the two preceding together. Pronotum slightly broader than long (40–43), finely and rather densely punctured, the punctures slightly more coarse near the anterior margin; anterior transverse impression shallow, arcuate across the disk with the convexity posterior, laterally the impression is filled with whitish pubescence. There are a few white hairs posteriorly, otherwise the vestiture is black. Scutellum black. Elytra with extremely fine punctures, these rather more densely set on the posterior than on the anterior half. Anterior half, except for the immediate scutellar region, whitish testaceous. Scutellar region and posterior half violaceous black. Vestiture fine, short and dense, each hair concolorous with the surface from whence it arises. Underparts of thorax and abdomen black with bluish reflections, legs black. Abdomen sparsely, thorax more densely and legs very densely set with whitish hairs. Length: 7.5 mm. Locality: Rurrenabaque.

Type and paratype.—Cat. No. 29357, U.S.N.M.

Subfamily HYDNOCERINAE

Genus HYDNOCERA Newman, 1838

4. HYDNOCERA HUACHIANA, new species

Form of *H. haematica* Gorham. Above testaceous with darker and lighter markings, underparts piceous black, legs pale. Head uniform dark testaceous, punctation fine and sparse on vertex, rather more

dense on front. Front densely clothed with depressed silvery pubescence. Antenna with basal segment and extreme apex of club pale, intermediate segments deep gray-brown. Mouth parts pale except for the piceous mandibles. Pronotum very slightly broader than long (19–20), widest at apical third, anterior transverse impression distinct but broad, disk transversely wrinkled anteriorly, punctures very fine and very sparse. Lateral dilations prominent, each carrying a single deep round pit; the anterior one of the usually present pair is obsolete. Color dark testaceous, flanks, except for the lateral dilations, piceous. Scutellum dark. Elytra widely separated apically, humeral callosities square and prominent, apices coarsely serrate, the serration continued along the sutural and lateral margins for a short distance, surface coarsely but not densely punctured. Color brownish testaceous, each elytron with a circular whitish spot at middle of length, the diameter of the spot almost equal to the breadth of the elytron; just before and behind the pale spot along the suture the elytron is infuscate. Vestiture pale, erect and sparse. Underparts sparsely covered with silvery pubescence. Terminal tergite of male roughly triangular with the apex truncate; it carries a poorly-defined median longitudinal carina. Fifth sternite much broader than last tergite, with a broad and deep triangular emargination, its edges tumid, the surface densely punctured and clothed with long hairs. Tarsal claws with very small basal tooth. Length: 4 mm. Locality: Huachi.

Type.—Cat. No. 29358, U.S.N.M.

Subfamily EPIPHLOEINAE

Genus PLOCAMOCERA Spinola, 1844

5. PLOCAMOCERA CONFRATER Kuwert

Plocamocera confrater KUWERT, 1893, Ann. Soc. Ent. Belg., vol. 37, p. 496.

Plocamocera confrater, var. *similis* KUWERT, Ann. Soc. Ent. Belg., vol., 37, p. 497.

Plocamocera confrater, var. *sericelloides* KUWERT, Ann. Soc. Ent. Belg., vol. 37, p. 497.

In the Mulford collection there are nine specimens of the genus *Plocamocera*, all of which I refer to this species. No two are exactly alike, either in the coloration of the ventral surface or in the elytral pattern. In length the specimens range from 3 mm. to 6 mm. The smallest, the largest, and two specimens intermediate in size were taken at Cavinas, the rest of the lot came from Tumupasa. One specimen is almost entirely pale beneath and fits the description of *P. confrater*, var. *sericelloides* Kuwert, another agrees well with the description of *P. confrater*, var. *similis* Kuwert; however, the series shows such a gradual increase in the extent of the dark coloration from that of var. *sericelloides* Kuwert to that of the typical *confrater* Kuwert that it does not seem of any use to preserve these varietal names.

Genus EPIPHLOEUS Spinola, 1841

6. EPIPHLOEUS TRICOLOR Kuwert

Epiphloeus tricolor KUWERT, 1893, Ann. Soc. Ent. Belg., vol. 37, p. 493.

Fifty-six specimens of this species were collected by the members of the party at Tumupasa. There is little variation displayed except that of size. The length is from 4.5 mm. to 7.5 mm.

7. EPIPHLOEUS BAKERI Wolcott

Epiphloeus bakeri WOLCOTT, 1912, Psyche, vol. 19, p. 74, pl. 6, fig. 5.

This species was collected only at Cavinas, where 17 specimens were obtained. The length is from 6.5 mm. to 7.5 mm.; otherwise the only noteworthy variation is in the extent of the white vestiture along the suture. In some specimens the suture is very narrowly edged, in others more widely.

8. EPIPHLOEUS DEBILIS Kuwert

Epiphloeus debilis KUWERT, 1893, Ann. Soc. Ent. Belg., vol. 37, p. 493.

This species is represented in the collection by three specimens, all from Cavinas. The length varies from 5.5 mm., to 7 mm., and some difference in the extent of the dark coloration of the hind femora is exhibited.

9. EPIPHLOEUS TIBIALIS Kuwert

Epiphloeus tibialis Kuwert, 1893, Ann. Soc. Ent. Belg., vol. 37, p. 495.

Collecting at Tumupasa yielded three specimens of this species. There is no apparent variation among them.

10. EPIPHLOEUS IRACUNDUS Wolcott

Epiphloeus iracundus WOLCOTT, 1912, Psyche, vol. 19, p. 74, pl. 7, fig. 1.

A single specimen from Tumupasa is virtually identical with a paratype of this species, which is very close to and possibly identical with *E. sexplagiatus* Kuwert.

11. EPIPHLOEUS MICACEUS, new species

Near *E. tricolor* Kuwert. Head castaneous, front moderately finely and very densely punctured, vertex with a central impunctate area, occiput finely wrinkled. Antenna with the basal segment pale, the rest piceous, all but the last three shining. Palpi pale, the apices of the terminal segments dark. Pronotum broader than long (25–36), anterior half of the disk strongly asperate, posterior half of disk and the flanks finely punctate, median portion of the disk strongly elevated. Color piceous; on each side of disk, reaching from anterior to posterior margins, there is a narrow stripe of rufotestaceous. Vestiture dense and depressed, yellow. Elytra coarsely and sparsely punctured, the punctures becoming more fine and more crowded toward the apices. Color piceous, each elytron with two rufotestaceous spots, one basal, the other median. The basal spot includes the entire basal margin and humeral callus and is prolonged posteriorly

a short distance, thence turning and almost reaching the suture. The median spot is transversely oval, not reaching either the lateral or the sutural margin. Vestiture dense, depressed, golden except for antemedian, postmedian, and apical spots of black. Underparts of the thorax piceous, of the abdomen rufotestaceous. Legs rufotestaceous, femora and tibiae with piceous markings. Length: 6–7 mm. Localities: Tumupasa, Cavinas.

Type and seventeen paratypes.—Cat. No. 29359, U.S.N.M.

This species is described from seventeen specimens from Tumupasa and one from Cavinas. The type is a male from Tumupasa. It is distinguished from *E. tricolor* Kuwert by the asperate pronotum, the absence of the subapical pale spot, and the much greater extent of the pale hairs on the elytra.

12. EPIPHLOEUS PILOSUS, new species

Brown, elytra variegated with dark brown, golden brown and white hairs. Head red-brown, vertex and occiput piceous, finely and very densely punctured, a small impunctate spot on the vertex between the eyes. Vestiture sparse, golden brown, mainly concentrated near the eyes, antennae, and above mouth. Antennae reaching to beyond the base of the pronotum, first and fourth to eighth segments pale, the remaining segments piceous. Pronotum broader than long (20–26), anterior half of the disk asperate, the asperations tending to form transverse ridges, posterior half of the disk finely punctulate, flanks rather coarsely and very densely punctured. Median portion of the disk strongly elevated, its posterior two-thirds and the flanks piceous, lateral portions of the disk and the anterior margin rusty brown; vestiture sparse, golden brown. Elytra coarsely, irregularly punctured, the punctures separated one from another by a distance equal to their diameter, densely clothed with a mixture of dark brown and golden brown depressed hairs, with a few white hairs which tend to form three ill-defined transverse fasciae dividing the length of the elytra into fourths. Underparts piceous and shining, legs pale, femora and tibiae broadly annulate with piceous. Length: 5 mm. Locality: Tumupasa.

Type.—Cat. No. 29360, U.S.N.M.

Obviously related to *E. obscurus* Kuwert but differing from that species in the total absence of white hairs on the head and thorax and in the dark underparts of the body.

Genus PHYLLOBAENUS Spinola, 1844

13. PHYLLOBAENUS MANNI Wolcott

Phyllobaenus manni WOLCOTT, 1912, Psyche, vol. 19, p. 73, pl. 6, fig. 4.

Three specimens from Tumupasa belong to this species. The determination was verified by Wolcott, who kindly compared one of the specimens with the type. The length varies from 5.5 mm. to 7 mm.

Genus PYTICEROIDES Kuwert, 1894

Since there has been some confusion as to the status of this genus since it was originally proposed by Kuwert[3] it seems best to redescribe it more completely.

Generic diagnosis: Epiphloeinae; head narrow, eyes large but not very prominent, finely granulate, ocular emargination anterior and moderately deep. Labrum bilobed. Antennae of nine segments, the first long, somewhat bent, the second slightly longer than broad and about one-third as long as the first, third shorter than the second and somewhat flattened, fourth to sixth transverse, each shorter than the one preceding, seventh to ninth broad and flat, each longer than the second to sixth together. End segments of all palpi cylindro-acuminate. Pronotum nearly equilateral, slightly constricted anteriorly, widest behind the middle, tactile hairs as usual in this subfamily. Elytra long, very slightly wider posteriorly, punctures in rows, those near suture sometimes slightly confused. Legs moderately long, tarsal claws with broad basal tooth.

Type of genus.—*Pyticeroides arrogans* Kuwert, 1894.

Gahan[4] has suggested that this genus is possibly equal to *Ellipotoma* Spinola, 1844. That genus was described as having the terminal segments of the labial palpi broadly securiform, not at all as in the species described above. Since the form of the labial palpi was specifically mentioned in Kuwert's diagnosis and since the present species agrees perfectly with his description as far as it goes it seems best to treat the two genera as distinct and valid.

14. PYTICEROIDES MANNI, new species

Slender, slightly broader behind. Eyes, antennae, terminal segments of palpi, and elytra black, rest of insect reddish-testaceous, the underparts sometimes infuscate. Head with the front slightly concave, sparsely punctured below the level of the antennal insertions, above densely and rather finely punctured; between the eyes there is a narrow vertical space devoid of punctures that extends onto the occiput. Pubescence sparse. Antennae reaching beyond the base of the pronotum, first segment in part or entirely pale, first six segments polished, last three segments dull. Pronotum slightly broader than long (17–20), anterior transverse impression shallow, surface more shining and more sparsely punctured than that of the front above the antennae, flanks rather more coarsely punctured than the disk, discal tactile setae arising from deep circular pits, which are separated by little more than one-half the breadth of the pronotum. Scutellum black, semicircular. Elytra nearly five times longer than the pronotum, each with ten rows of deep, almost quadrate

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[3] Ann. Soc. Ent. Belg., 1894, vol. 38, p. 7.

[4] Ann. Mag. Nat. Hist., 1910, ser. 8, vol. 5, p. 73.

punctures, the intervals on the disk more than the width of a puncture and finely punctulate, puncture rows becoming confused beyond the apical fifth, first row (from suture) somewhat irregular. Pubescence sparse, gray, depressed. Underparts highly polished, very finely and very sparsely punctured. Length: 4–6 mm. Locality: Cavinas.

Type and fifteen paratypes.—Cat. No. 29361, U.S.N.M.

This species agrees rather well with the description of the type of the genus except for color. However, it appears to be quite a different insect.

Genus ICHNEA Castelnau, 1836

15. ICHNEA SERICEA (Klug)

Enoplium sericeum Klug, 1842, Clerii, p. 373, pl. 2, fig. 16.

Apparently a common species. Forty-four specimens were taken at Tumupasa, four at Cavinas, and one at Rurrenabaque. The specimens are remarkably alike in all respects except size. Size variation is from 7 mm. to 9 mm.

16. ICHNEA MARGINELLA (Klug)

Enoplium marginellum Klug, 1842, Clerii, p. 376.

A single specimen was taken at Yvon. It agrees with Klug's description in all points except the color of the scutellum, which is dark in this case. The thoracic ratio is 24–23.

17. ICHNEA ROSEICOLLIS Kuwert

Ichnea roseicollis Kuwert, 1894, Ann. Soc. Ent. Belg., vol. 38, p. 9.

Somewhat resembles the preceding but is separated from it easily by the thoracic ratio (23–26). The amount of dark color on the pronotum varies quite considerably, in two specimens examined it is almost lacking. The length of the smallest specimen in the Mulford collection is 6.5 mm., that of the largest, 8 mm. Six specimens of this species were obtained at Tumpasa.

18. ICHNEA HUMERALIS, var. IRRITA Wolcott

Ichnea humeralis, var. *irrita* Wolcott, 1912, Psyche, vol. 19, p. 76, pl. 7, fig. 4.

Two specimens, both of which I refer to this species, were taken by the expedition. One from Cachuela Esperanza is but 5.5 mm. long, the other is from Cavinas and measures 9 mm. Except for size there is nothing to separate the two. Though the lateral margin is pale for but a short distance behind the humeral angle, they compare so favorably with a specimen of *irrita* Wolcott from the type series that I have no hesitation in so identifying them.

19. ICHNEA STRIATICOLLIS Kuwert

Ichnea striaticollis Kuwert, 1894, Ann. Soc. Ent. Belg., vol. 38, p. 11.

This species resembles strongly a lycid of the genus *Calopteron* and is more properly a member of the genus *Ichnea* than any of

those previously mentioned. In fact, it is quite evident that a division of *Ichnea* along the lines proposed by Gorham in the Biologia Centrali-Americana is necessary. Eleven specimens of this species were taken, seven at Tumupasa and two each at Yvon and Cachuela Esperanza. There is considerable variation in size, the smallest and largest specimens, both from Tumupasa, measuring, respectively, 6 mm. and 10.5 mm. There is also a very interesting color variation displayed. All of the specimens from Tumupasa have antennae which are entirely black, and of these, four have the tarsi entirely black. The remaining three specimens from Tumupasa have the third to fifth tarsal segments pale. The Yvon and Cachuela specimens are similar to these last mentioned in tarsal coloration but all have the apical half of the terminal segment of the antenna pale. This last color phase is as described in the original reference to the species. There is also some variation in the extent of the pale coloration on the under side.

Subfamily ENOPLIINAE.

Genus CREGYA LeConte, 1861. (GALERUCLERUS Gahan, 1910)

20. CREGYA POSTICALIS, new species

Shining brownish-black; head except occiput, flanks of prothorax, extreme apices of elytra, femora and basal halves of tibiae pale. Head finely but not densely punctured, sparsely pubescent, occipital spot extending forward onto the vertex, antennae ten-segmented, dark except for the first segment which is pale beneath. Pronotum slightly longer than broad (25–24), sharply dilated at the sides just behind the middle, surface polished; on disk the punctation is very fine and sparse, on the flanks coarse and moderately dense. Flanks narrowly behind, more broadly in front, pale testaceous; disk narrowly in front, behind including the entire base, brownish-black. Elytra coarsely punctured on the basal two-thirds, very finely punctulate on apical third; the coarse punctures are in rows on disk, they are confused on the flanks. Vestiture sparse and erect, pale. The underpart of the pro- and meso-thoraces pale, metathorax dark, abdomen castaneous. Legs pale, anterior femora with dark spot at apices, anterior tibiae dark externally, middle tibiae dark at apices, all tarsi dark. Length: 5 mm. Locality: Rurrenabaque.

Type.—Cat. No. 29362, U.S.N.M.

Nearest allied to *C. frontale* (Kuwert) from which it differs in the arrangement of the dark and light areas.

O

ON A COLLECTION OF ORTHOPTEROID INSECTS FROM JAVA MADE BY OWEN BRYANT AND WILLIAM PALMER IN 1909

By A. N. Caudell

Of the Bureau of Entomology, United States Department of Agriculture

The expedition to Java in 1909 by Bryant and Palmer was made under the auspices of the United States National Museum, though financed largely by Doctor Bryant. By agreement the material collected was delivered to the Museum for determination by specialists associated with that institution, a set of duplicates to be returned to Doctor Bryant. The following report is on that portion of the insects collected belonging to the orders Dermaptera and Orthoptera.

Order DERMAPTERA[1]

Family ARIXENIIDAE

ARIXENIA JACOBSONI Burr

Arixenia jacobsoni Burr, Ent. Mo. Mag., ser. 2, vol. 23, 1912, p. 105, fig.

Single specimen, a male much broken, of this aberrant earwig was in the collection, taken at Pelaboean Ratoe. Unfortunately, it bears no date or other information.

Family FORFICULIDAE

Subfamily Pygidicraninae

DIPLATYS NIGRICEPS Kirby

Diplatys nigriceps Kirby, Journ. Linn. Soc. Lond., vol. 23, 1891, p. 507.

One female, Mount Salak, May 5.

KALOCRANIA SIAMENSIS Dohrn

Pygidicrana siamensis Dohrn, Stett. Ent. Zeit., vol. 24, 1863, p. 51.

Three males, Buitenzorg, March and April 15.

[1] The Dermaptera, with the exception of the family Arixeniidae and the forficulid genera *Labidura* and *Platylabia*, were determined by Dr. Malcom Burr over a decade ago, and the subfamily grouping is as arranged by him except that he gave family rank to the groups here used as subfamilies.

ECHINOSOMA SUMATRANUM DeHaan

Forficula (Echinosoma) sumatranum DEHAAN, Verh. Nat. Gesch. Nederl. Overz. Bezitt. Orth., 1842, p. 244.

One male, one female, two nymphs, Megamendg Mountains (4,200 feet altitude); three nymphs, Tjibodas, Mount Gede (7,800 feet altitude).

Subfamily LABIDURINAE

ALLOSTETHUS INDICUM Burmeister

Forficula indicum BURMEISTER, Handb. Ent., vol. 2, 1838, p. 751.

One male, Mount Salak; one nymph, Buitenzorg, March.

GONOLABIS JAVANA Bormans

Anisolabis javana BORMANS, Ann. Soc. Ent. Belg., vol. 27, 1883, p. 63, pl. 2, fig. 4

One male, Tjibodas, Mount Gede, January 20. Doctor Burr writes that this is the third known specimen of this rare species.

EULABIS KIRBYI Burr

Anisolabis ? kirbyi BURR, Ann. Mag. Nat. Hist., vol. 20, 1897, p. 311.

One male, Tjibodas, Mount Gede, August 26. This also, says Doctor Burr, is the third known specimen of its kind, the other two being in his collection. This specimen differs from the others, according to Burr, in the feeble development of the keels on the penultimate ventral segment and in the nearly symmetrical forceps. Burr had this placed in the genus *Gonolabis* but he has recently referred it to *Eulabis*.[2]

LABIDURA RIPARIA Pallas

Forficula riparia PALLAS, Reise Rus. Reichs., vol. 2, Anhang, 1773, p. 727.

One female nymph, Buitenzorg. This specimen was not taken by Bryant and Palmer, but is listed here because it is present in the National Museum collection.

PLATYLABIA MAJOR Dohrn

Platylabia major DOHRN, Stett. Ent. Zeit., vol. 28, 1867, p. 347.

Two males and two females, Megamendg Mountains.

Subfamily LABIINAE

IRDEX NITIDIPENNIS Bormans.

Spongiphora nitidipennis BORMANS, Ann. Mus. Stor. Nat. Genova, ser. 2, vol. 14, 1894, p. 382.

Two females, Mount Salak, May 15.

SPONGOVOSTOX SEMIFLAVUS Bormans

Spongiphora semiflavus BORMANS, Ann. Mus. Stor. Nat. Genova, ser. 2, vol. 14, 1894, p. 385.

One female, Buitenzorg, April 18.

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[2] Journ. Royal Microscop. Soc., 1915, p. 537.

LABIA MUCRONATA Stal

Labia mucronata STAL, Eug. Resa. Ins., 1860, p. 303.

One male, Buitenzorg, July 3.

LABIA PYGIDIATA Dubrony

Labia pygidiata DUBRONY, Ann. Mus. Stor. Nat. Genova, vol. 14, 1879, p.364.

One broken specimen, Tjibodas, Mount Gede, April 20.

Subfamily CHELISOCHINAE

CHELISOCHES MORIO Fabricius

Forficula morio FABRICIUS, Syst. Ent., 1775, p. 270.

Three males,' thirty-four nymphs from Buitenzorg, all in March, except one male on April 18, and one female from Pelaboean Ratoe.

ENKRATES ELEGANS]

Chelisoches elegans BORMANS, Ann. Mus. Stor. Nat. Genova, ser. 2, vol. 20, 1900, p. 464.

Five males, four females, Megamendg Mountains (4,200 feet altitude).

HAMAXAS FEAE Bormans

Chelisoches feae BORMANS, Ann. Mus. Stor. Nat. Genova, ser. 2, vol. 14, 1894, p. 393.

One female, Buitenzorg, July 3.

Subfamily FORFICULINAE

SKENDYLE JAVANA(?) Bormans

Ancistrogaster javanus BORMANS, Ann. Mag. Nat. Hist., ser. 7, vol. 11, 1903, p. 266.

One male, Pangranggo; one female, Buitenzorg, April 25; two females, one nymph, Tjibodas, Mount Gede. Doctor Burr queried this determination and, apparently through inadvertence, credited the name to Verhoeff. The male appears to agree very well indeed with the specimen figured by Burr.[3]

KOSMETOR POULTONI Burr

Opisthocosmia poultoni BURR, Ann. Mag. Nat. Hist., ser 7, vol. 16, 1905, p. 491.

One male, Tjibodas, Mount Gede, September. Doctor Burr returns this as named above but points out that this specimen differs from the unique type in the black head and pronotum and the more constricted forceps. He suggests that it is perhaps a new species.

KOSMETOR, species

One female, Buitenzorg, March.

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[3] Gen. Insectorum, fasc. 122, pl. 9, fig. 18.

Order ORTHOPTERA

Family BLATTIDAE

Subfamily BLATTINAE

CATARA MINOR Krauss

Catara minor KRAUSS, Semon. Zool. Forsch. Austral., vol. 5, 1903, p. 753, pl. 47, fig. 3.

Three females, three nymphs, Tjibodas, Mount Gede, April 20; three females, two nymphs, Buitenzorg, March.

DORYLAEA BRYANTI, new species

Two males and two females of a medium-sized black roach occurred in the collection which apparently pertains to the genus *Dorylaea*, but can not be identified with any described species. It is therefore christened *bryanti*, in honor of the leader of the expedition, and described as follows:

Description, male and female.—General color very dark chestnut brown, the male the darker, being almost black; the female is decidedly lighter, especially the tegima; abdomen black above and below in both sexes; legs, clypeus, mouth parts, and antennae yellow, the antennae beyond the base and the tarsi a little darker; head shining, piceous in the male and chestnut in the female, the eyes black to grayish yellow mottled with black.

Head with the vertex slightly exposed in both sexes; eyes separated by a space about one and one-half times greater than the width of one of them; interocellar space scarcely narrower than the interocular space.

Pronotum smooth and shining; anterior margin narrowly rounded; posterior margin very broadly rounded, almost subtruncate, mesially barely produced; disk with the widest point well posterior of the middle.

Legs moderately slender; femora spined beneath, the anterior ones on the caudal margin with four or five long spines and a few shorter ones on the apical half and the cephalic margin with a row of ten or eleven long spines extending along the greater portion of the length, the basal one very short and those toward the apex of the femur somewhat shorter than the others; the posterior metatarsus is approximately equal in length with the other segments combined and armed beneath for almost its entire length with a double row of bristles; the second segment of the posterior tarsus is very slightly longer than the succeeding two and is armed beneath on the basal four-fifths with a double row of bristles; third segment short and armed beneath on the basal two-thirds with bristles; pulvilii very short except that of the fourth segment where it extends for the greater part of the length of the segment; arolia present, moderately large.

Tegmina shorter than the abdomen in both sexes, in the male covering about four-fifths its length and in the female something over one-half; wings slightly shorter than the tegmina in the female and about one-third shorter in the male.

Abdomen moderately broad; supra-anal plate of male three times broader than long, apically rather narrowly rounded, of female about twice as broad as long, subtruncate; subgenital plate of male transverse, apically entire and bearing a pair of small articulated one-segmented styles, of female valvular; cerci of both sexes short, broad and flat, separated by a distance about equal to their length; all of the segments transverse except the apical two, the broadest point at the middle; concealed genital organs of male consisting of a rather broad ventral plate lying mostly on the right side, to the left of this, projecting from beneath a submembranous dextral plate, is the usual slender apically pointed sinistral hook with a brief subapical tooth; overlying the above noted organs is a broad irregular dextral plate with a somewhat swollen apex and with a small flattened clavate subbasal appendage on the right margin, and to the right of this plate is another thick, irregularly curved plate; these complicated organs are clearly seen only in the holotype.

Measurements.—Length, pronotum, male 4, female 4.5 mm.; tegmina, male and female 8 mm.; width, pronotum, male 5.25, female 6 mm.

Holotype.—Male, Buitenzorg, Java, in March; allotype, female, Megamendg Mountains, Java (4,000 feet altitude); paratype A, male, and B, female, Tjibodas, Mount Gede, Java, April 20.

Holotype and allotype in National Museum; paratypes returned to Bryant.

Type.—Cat. No. 29135, U.S.N.M.

The two paratypes are decidedly broader than the others but show no structural differences; this imparts to those specimens a very different appearance due partly to a more decided contraction of the abdomen and especially to the fact that in them the tegima are flat while in the holotype and allotype the tegima in drying were somewhat rolled longitudinally. The pronotum of the male paratype is also noticeably blacker than in the holotpye.

DORYLAEA, species

One immature specimen, evidently a female, Tjibodas, Mount Gede, April 20.

It is possible that this is the nymph of *D. bryanti* described above; a series of short longitudinal ridges on the posterior portions of the dorsal segments of the abdomen of this nymph suggest specific difference, however, as there is no indication of such in *bryanti*.

HOMALOSILPHA USTULATA Burmeister

Periplaneta ustulata BURMEISTER, Handb. Ent., vol. 2, 1838, p. 503.

One female, Soekaboemi, March 25; one nymph, Buitenzorg, March; two nymphs, Mount Salak, March 7 (2,500 feet altitude).

These characteristic appearing nymphs are large, the largest being 27 mm. in total length; the abdomen is wholly black except the supra-anal plate and the median portion of the venter, which are yellow; legs and basal part of antennae black; thorax yellowish, the disk of the three sections posteriorly margined with black and their disks with maculations of the same color, on the pronotal disk assuming the shape of a roughly formed circle inclosing a median longitudinal stripe with a spot on each side of it. The pronotal disk differs from that of the adult by being decidedly broadest considerably behind the middle, especially noticeable in the smaller nymph; the maculation on the pronotal disk of the adult is much more reduced than in the case of the nymphs, but there is perhaps considerable variation in these markings.

NEOSTELEOPYGA PROPOSITA Shelford

Steleopyga proposita SHELFORD, Ann. Mag. Nat. Hist., ser. 8, vol. 8, 1911, p. 5, pl. 1, fig. 1.

One male, three females, Buitenzorg, April 15; one large female nymph, Pelaboean Ratoe.

The labrum and clypeus vary somewhat in color, being often quite as black as the palpi.

NEOSTELEOPYGA SEMONI Krauss

Steleopyga semoni KRAUSS, Orth. Austr. & Malay Archipel., 1902, p. 751.

One male, Buitenzorg, March; one male, two females, Tjibodas, Mount Gede, April 20 and September.

PERIPLANETA AUSTRALASIAE Fabricius

Blatta australasiae FABRICIUS, Syst. Ent., 1775, p. 271.

Two males, one female, Mount Salak, May 15; one female, two nymphs, Buitenzorg, April 18 and March.

PERIPLANETA BRUNNEA Burmeister

Periplaneta brunnea BURMEISTER, Handb. Ent., vol. 2, 1838, p. 503.

Twenty-two adults and five nymphs from Buitenzorg in March and April and one nymph from Tjibodas in September.

The above series shows a gradual variation in color from those with the pronotum and tegmina almost black, as shown in Shelford's figure of *P. lata* Herbst,[4] to those in which those portions are almost

[4] Gen. Insectorum, fasc. 109, pl. 2, fig. 16.

as light colored as in *P. americana.* It seems rather doubtful if the form figured as *lata* by Shelford as above mentioned is really Herbst's species. It is probable that the real *P. lata* is a light colored form of *brunnea*, as in color it must be similar to *americana* which it is said by the describer to resemble. The blacker forms may perhaps be the *P. robinsoni* of Hanitsch. If *P. lata* does fall here, that name will have to be used, as it is the older.

Subfamily CORYDINAE

HOLOCOMPSA DEBILIS Walker

Holocompsa debilis WALKER, Cat. Blatt. Brit. Mus., 1868, p. 192.

One female, Buitenzorg, April.

This specimen and another, also a female, from Mindanao, P. I., now before the writer, extend the recorded distribution of this species some distance both north and south. The female differs from the male in having the organs of flight but moderately exceeding the tip of the abdomen. There is little variation noticeable in these specimens from Mindanao and Buitenzorg; the length of body is about the same as in the male; the tegmina are about the same length as the body instead of over twice as long as in the male. The cerci of both these females are yellow and distinctly segmented, the color strongly contrasted with that of the abdomen.

Subfamily ECTOBIINAE

ANAPLECTA JAVANICA Saussure

Anaplecta javanica SAUSSURE, Ann. Mus. Stor. Nat. Genova, ser. 2, vol. 15, 1895, p. 71.

One female, Pelaboean Ratoe.

AREOLARIA FIEBERI Brunner

Areolaria fieberi BRUNNER, Syst. Blatt., 1865, p. 260, pl. 6, fig. 27.

One female, Buitenzorg, April 25.

EUTHEGANOPTERYX, species

One male, Pleboean Ratoe.

This specimen is in very poor condition, too imperfect to justify description, though it very probably represents an undescribed species.

Subfamily EPILAMPRINAE

EPILAMPRA LAEVICOLLIS Saussure

Epilampra laevicollis SAUSSURE, Mem. Soc. Geneve, vol. 23, 1874, p. 129, pl. 10, fig. 45.

Three females, one nymph, Tjibodas, Mount Gede, April 20.

EPILAMPRA LURIDA Burmeister

Epilampra lurida BURMEISTER, Handb. Ent., vol. 2, 1838, p. 505.

Three females, Buitenzorg, April 10, 25, June; one female, Pelaboean Ratoe.

From published characters it seems hardly possible to separate this species from *albina* Saussure; whether they really are distinct or not may be questioned. The *E. trogana* of Rehn from Lower Siam appears to be very near *lurida*.

PSEUDOPHORASPIS NEBULOSA Burmeister

Epilampra neublosa BURMEISTER, Handb. Ent., vol. 2, 1838, p. 505.

One male, four females, Buitenzorg, April and March; one female, Mount Salak, May 15; two males, Pelaboean Ratoe.

There is a decided color variation exhibited in this series, some specimens being almost unicolorously yellowish brown while others are more or less variegated with blackish markings, mostly of an indefinite rounded shape; one specimen from Buitenzorg has a very noticeable blackish spot about 2 mm. in diameter near the center at the apical fourth of the tegmina, while another specimen taken at the same place and time has no indication of such a spot.

The posterior metatarsus of this species is a little shorter than the rest of the segments combined. The tegmina of the female are apically roundly concave but those of the male are rounded.

Subfamily PANCHLORINAE

PYCNOSCELUS SURINAMENSIS Linnaeus

Blatta surinamensis LINNAEUS, Syst. Nat., 10 ed., vol. 1, 1758, p. 424.

One female, nine nymphs. Buitenzorg, the female in March, the nymphs in April and June; one nymph, Megamendg Mountains (4,200 feet altitude).

Recent breeding experiments have proved this cosmopolitan roach to be viviperous, rarely perhaps otherwise, and to breed parthenogenetically.

Subfamily PANESTHINAE

MIOPANESTHIA STENOTARSIS Saussure

Miopanesthia stenotarsis SAUSSURE, Rev. Suisse de Zool., vol. 2, 1895, p. 325, pl. 9, fig. 2.

Three nymphs, Tjibodas, Mount Gede, April 20.

PANESTHIA ANGUSTIPENNIS Illiger

Blatta angustipennis ILLIGER, Magaz. Insekt., vol. 1, 1801, p. 185.

Two males, Mount Salak, March 7 (2,500 feet altitude).

PANESTHIA JAVANICA Serville

Panesthia javanica SERVILLE, Ann. Sci. Nat., vol. 22, 1831, p. 38.

One male, four females, Mount Salak (3,000 feet altitude); one female, Megamendg Mountains; one female, Buitenzorg.

SALGANEA AMBOINICA Brunner

Salganea amboinica BRUNNER, Ann. Mus. Genova, vol. 33, 1893, p. 47.

Four nymphs, Tjibodas, Mount Gede, April 20.

SALGANEA MORIO Burmeister

Panesthia morio BURMEISTER, Handb. Ent., vol. 2, 1838, p. 513.

One male, two females, Tjibodas, Mount Gede, April 20. One female specimen with label indicating capture at an altitude of 4,000 feet.

SALGANEA RUGULATA Saussure

Salganea rugulata SAUSSURE, Rev. Suisse de Zool., vol. 3, 1895, p. 304.

Four nymphs, Tjibodas, Mount Gede, April 20.

Subfamily PERISPHAERINAE

PERISPHERUR ARMADILLO Servillle

Perispherus armadillo SERVILLE, Ann. Sci. Nat., vol. 22, 1831, p. 44.

One female, Buitenzorg, March.

PSEUDOGLOMERIS FLAVICORNIS Burmeister

Perisphaeria flavicornis BURMEISTER, Handb. Ent., vol. 2, 1838, p. 488.

One female, Tjibodas, Mount Gede, April 20.

Subfamily PSEUDOMOPINAE

BLATTELLA BREVIALATA, new

A single female specimen is the basis of the following description. This is in very poor condition, the antennae and the fore and middle legs being absent, and the tip of the abdomen is also partly broken away. However the wings and other portions still intact present characters apparently distinctive and it is deemed advisable to describe it as a new species under the above name.

Description, female (*male unkown*).—Head projecting rather decidedly beyond the pronotum and yellowish brown in color with darker fleckings and somewhat darker between the eyes; eyes noticeably lighter than the adjacent portions of the head; basal segment of antennae, the only portion present, concolorous with the head.

Pronotal disk broader than long, broadening posteriorly, the widest point near the posterior border, which is very broadly rounded with a very inconspiucous median prolongation; anterior margin almost subtruncate mesially; lateral margins rounded and very little deflexed;

the disk is broadly margined laterally with yellowish and narrowly so posteriorly, the disk with two broad longitudinal maculations converging at the ends, almost meeting anteriorly, the space between them slightly maculate. Abdomen infuscated above, with the posterior half of the lateral margins of most segments yellowish, beneath a little lighter; tip of abdomen mutilated; cerci long and broadly flattened, distinctly segmented, the segments nine in number, the terminal one twice as long as broad, the basal three transverse and the rest subquadrate.

Legs absent except the posterior femora and tibiae and the basal four segments of one tarsus; hind femora strongly armed beneath, the color light yellowish with numerous minute fuscous specks; tarsi black at insertions of the spines.

Tegmina exceeding the tip of the abdomen; discoidal sectors four or five in number and longitudinal; costal veins not clavate, about ten in number and very long. Wings very short, no more than one-half as long as the tegmina but with well developed venation; ulnar vein simple; costal veins five or six in number, mostly once forked and but slightly clavate.

Measurements.—Length, pronotum, 2.5 mm.; tegmina, 7 mm.; width, head, 2 mm.; pronotum, 3.5 mm.; tegmina, 2.75 mm.

Holotype.—Female, Buitenzorg, March. In National Museum.

Type.—Cat. No. 29136, U.S.N.M.

This species seems most nearly allied to the *Blatella alliena* of Brunner from Burma but appears to differ in various characters from that somewhat larger form.

BLATELLA PALMERI, new species

Description, male (female unknown).—Conforming with the diagnostic features of the genus in which it is placed in having discoidal sectors of the tegmina longitudinal, the ulnar branch forked, with the posterior branch itself forked, and the anterior femora armed beneath with a complete row of spines, those toward the apex of the femora shorter. The wing, however, has a very conspicuous apical triangle, almost as board basally as the anterior field of the wing but not attaining the apex of that field and with the outer margin sinuate, thus excluding this roach from the subfamily Ectobiinae where this triangle is apically rounded and either clearly as broad as the anterior field of the wing or attains the apex of that field, usually both.

The general color is dark reddish brown, the surface polished. Head uniformly dark brown, the eyes somewhat lighter; antennae fuscous, slightly lighter basally. Pronotal disk polished, without furrows or other inequalities, the sides of the disk light yellowish and the center very dark reddish brown without variegation; this dark central portion touches the posterior margin of the disk for its entire

width and the anterior margin but briefly; the pronotal disk is approximately as broad as long, the posterior margin very broadly obtuse-angulate, the anterior margin subtruncate; the whole disk is decidedly broader posteriorly and laterally distinctly deflexed.

Tegmina noticeably exceeding the tip of the abdomen and apically pointed; color of tegmina polished reddish brown, somewhat lighter than the pronotal disk, the humeral areas pale yellowish; there are over a dozen costal veins and about a dozen longitudinal discoidal sectors; the anal area is rather long, about three times as long as the greatest width. Wings in repose just reaching the tips of the tegmina, apically strongly sinuate; there are about a dozen slightly clavate costal veins and the ulnar vein is bifurcate as previously mentioned, both branches directed to the apex of the wing. Figure 1 shows the venation of the wing.

Abdomen blackish above, with lighter variations apically, the basal portion light, as is also the ventral surface and the legs. Supra-anal plate about as long as broad, apically rounded, a brief shoulder formed on either side near the base by an abrupt but brief narrowing of the plate at that point; cerci long, exceeding the tip of the supra-anal plate by one-half their length and comprising eight distinct segments; subgenital plate strongly asymmetrical, the right half horizontal and slightly convex, the lateral margin curved downward, the left side longer and abruptly turned up at right angles to a vertical position; closely fitting into the angle thus formed is an outwardly rounded, somewhat flattened organ with the inner margin forming a large, flattened irregular-shaped flange bearing two bunches of several very long, sharp, stout, spinelike bristles, those of the basal bunch directed inwardly and those on the more apical bunch directed caudad; this organ is a part of the concealed genitalia, though at a casual glance it is easily mistaken for a part of the subgenital plate; the unique specimen has not been dissected for the examination of the concealed genital structures. Overlying the lateral margins of the third dorsal segment of the abdomen preceding the supra-anal plate, and lying in a lateral fold or depression in that segment, is an elongate, somewhat club-shaped organ which arises near the median line and is directed laterally and very slightly caudad, the tip rounded, very gently and

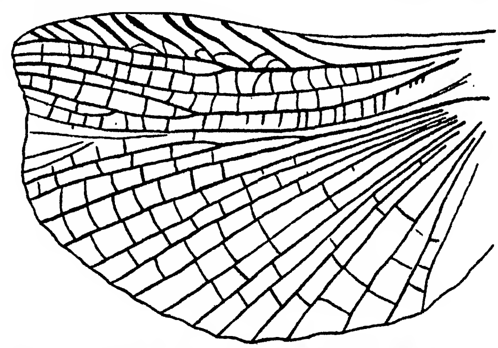

FIG. 1.—WING OF BLATTELLA PALMERI, NEW SPECIES.

bluntly recurved and bearing many short, fine, backwardly directed hairs, the whole forming a very striking modification, which, together with the curiously modified subgenital plate with its peculiar termination, will serve to readily differentiate the male of this species from its described allies.

Legs strongly spined; anterior femora armed beneath on the anterior margin with a dozen stout spines occupying about the apical four-fifths of the entire length, the apical one long, the next one-half as long, the next three still a third shorter, and the rest successively longer and stouter till those at the base are fully as long as and slightly stouter than the apical one; the opposite margin bears four or five large spines; posterior legs absent; arolia present but rather small.

Measurements.—Length, pronotum, 3 mm.; tegmina, 10 mm.; width, head, 2.25 mm.; prontum, 3.25 mm.; tegmina, 3 mm.

Holotype.—Male, Tjibodas, Mount Gede, Java, April 20. In National Museum.

Type.—Cat. No. 29137, U.S.N.M.

BLATELLA, species

One male, Buitenzorg, March.

This is apparently not any one of the species of the genus recorded from Java. Like *B. hewitti* Shelford, it resembles superficially an *Ischnoptera.*

MARGATTEA ANCEPS Krauss

Blatta (*Phyllodiomia*) *anceps* KRAUSS, Semon's Zool. Forsch. Austral. & Malay Archipel., vol. 5, 1903, p. 749.

Two females, Tjibodas, Mount Gede (7,000 feet altitude); one female, Mount Salak, April 5.

This species was described in the genus *Blatta*, subgenus *Phyllodromia*, later referred to *Allacta* by Kirby, and still later listed in *Phyllodromia* by Shelford. Its real position, as shown by the present specimen, is in the genus *Margattea* of Shelford.

MARGATTEA BUITENZORGENSIS, new species

Description, male (*female unknown*).—General color uniformly pale yellowish. Head narrow, projecting considerably from beneath the pronotal disk; eyes somewhat darker than the general color and rather widely separated, connected on the vertex by a broad reddish-brown band; antennae yellowish, the basal segment with a fuscous spot beneath; palpi same color, the terminal segment flattened and infuscated beneath.

Pronotal disk slightly transverse, narrower anteriorly, the lateral margins translucid and rounded, the anterior and posterior margins

very broadly rounded, the mesial portion of the disk marked with some irregular dark lines and spots, though not very conspicuously so. Organs of flight considerably surpassing the tip of the abdomen; tegmina with the discoidal sectors longitudinal, few in number; costal veins about a dozen in number, those at the middle of the tegmina being half as long as the width of the tegmina; wings about twice as long as broad, wholly membraneous and transparent with brown venation; costal veins about nine in number, the apical two or three forked, the basal seven strongly clavate apically, as is also the subcostal vein, which thus resembles one of the clavate costal veins, as shown in Figure 2; ulnar vein four forked, all branches terminating in the apical margin of the wing; a small apical triangle present.

Legs yellowish, with the insertions of the rather slender concolorous spines black; anterior femora with the anterior ventral margin armed distally with two long spines, preceded by a row of exceedingly fine and short spinules of equal length, and basad of these there are four very long stout spines.

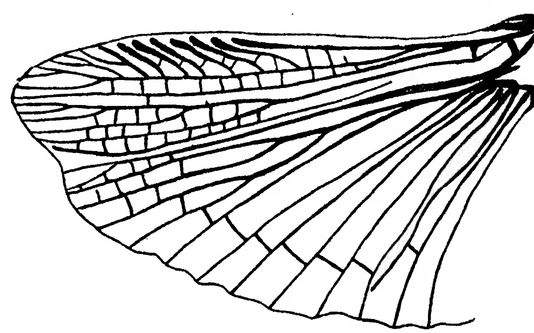

FIG. 2.—WING OF MARGATTEA BUITENZORGENSIS, NEW SPECIES

Abdomen above with the segments mesially fuscous, the margins only yellowish, and beneath the color is yellowish with some rather small and obscure blackish spots along the sides; supra-anal plate about twice as broad as long, apically rounded, entire, the dorsal surface with a slight longitudinal median carina; subgenital plate transverse, apically rounded and entire; the lateral margins of this plate in the single specimen studied are slightly rolled downward and inward, making it probable that in life there are notches at the intersections of the styles; styles yellow, very slender and terminating in a hair; cerci long, distinctly segmented, somewhat flattened and beneath slightly infuscated toward the apex; dorsally the abdomen has the second segment preceding the supra-anal plate apically and mesially formed into a very small slightly raised recurved flap terminated by a bunch of short yellow bristles; this modification is so small as to be very easily overlooked.

Measurements.—Length, pronotum, 2 mm.; tegmina, 9 mm.; width, head, 1.5 mm.; pronotum, 2.6 mm.; tegmina, 2.5 mm.

Holotype.—Male, Buitenzorg, March. In National Museum.

Type.—Cat. No. 29138, U.S.N.M.

This species seems to be somewhat allied to the *Blattella nebulosa* of Shelford from Borneo but lacks the nebulous markings of the tegmina; it also seems close to the Bornean *Blattella nimbata* Shelford, but the supra-anal plate is not at all notched apically. *Blattella vilis* Brunner and *B. contigua* Walker are two other roaches which the present one apparently resembles in some particular or another, but there are some characters present in the one here described which seem to preclude its being referred to either of them.

SORINEUCHORA, new genus

Description.—Head with the eyes very widely separated. Organs of flight fully developed, exceeding the tip of the abdomen, smooth and with distinct venation; radial and ulnar veins separate and parallel except basally where they almost or quite merge; anterior field broad, at the middle of the tegmen broader than the post-radial area; discoidal sectors diagonal. Wings with a very small triangular apical area; ulnar vein branched, the branches all directed to the apex of the wing.

Legs with all the femora unarmed beneath; arolia present.

Abdomen without noticeadle dorsal modification; supra-anal and subgenital plates transverse; styles present in male; cerci long and flattened, distinctly segmented and projecting most their length beyond the supra-anal plate.

Genotype.—*Sorineuchora javanica*, new species.

This genus would fall into the subfamily Oxyhaloinae in the keys of Brunner and Shelford, but the absence of a conspicuous apical triangular area in the wings makes it appear advisable to refer it to the Pseudomopinae, in a section of that group in which the femora are unarmed beneath. This genus is structurally allied to the Australian genera *Choristima* Tepper and *Aphlebidea* Brancsik, which have been hithereto referred to the subfamily Ectobiinae, but which are here referred to the Pseudomopinae in the same section as the new genus here described.

SORINEUCHORA JAVANICA, new species

Description, male and female.—Entire insect of a pellucid and very light yellowish color with a tinge of greenish. Head with the eyes darker, set far apart and with two small piceous spots between them; antennae unicolorous, sometimes slightly darker than the general coloration of the body but generally concolorus. Pronotal disk much broader than long, posteriorly broadly truncate, anteriorly broadly rounded, the lateral margins broadly expanded, not or but little deflexed, and transparent. Tegmina with the radial and ulnar veins parallel and rather widely separated to near the base, the former sending a dozen or more nonclavate costals to the front margin and the

ulnar, with about half as many diagonally directed branches with distinct cross veins between them, in most lights giving a general network appearance; anterior field broader at the middle of the tegmen than the postulnar region. Wings in repose surpassing very slightly the tips of the tegmina; ulnar vein with two branches, both directed to the apex of the wing; costal veins nine or ten in number and scarcely clavate.

Abdomen scarcely longer than broad; supra-anal plate transverse in both sexes, in the male apically very obscurely and briefly notched, in the female with a very small triangular notch; subgenital plate of male transversely triangular and asymmetrical, a groove running diagonally across the plate with a ridge at the right terminating in a small apical tubercle; on each side on an apical notch formed by this groove and ridge is a small, stout, unsegmented articulated style; these styles are set very close together, and are scarcely twice as long as broad, apically rounded and there furnished with some short stout setae; in the female the subgenital plate is transverse, apically very broadly rounded and mesially with a very small apical notch; cerci long, flattened and distinctly segmented, apically pointed, those of the male noticeably the longer.

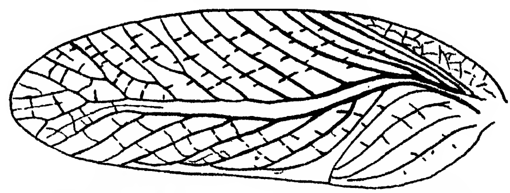

FIG. 3.—TEGMEN OF SORINEUCHORA JAVANICA, NEW SPECIES.

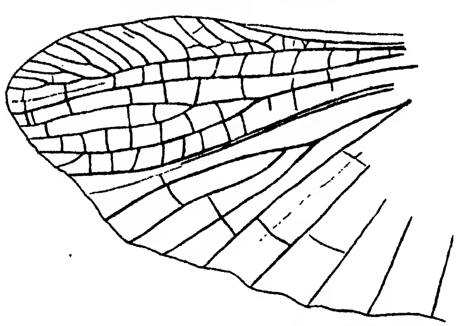

FIG. 4.—WING OF SORINEUCHORA JAVANICA, NEW SPECIES.

Measurements.—Male and female, length, pronotum, 2.25 mm.; tegmina, 8.5 to 9 mm.; width, head, 1.5 mm.; pronotum, 3.75 mm.; tegmina, 3 mm.

Holotype.—Male, Buitenzorg, Java, April; allotype, female, Pelaboean Ratoe, Java; paratypes A, B, and C, males, same data as allotype, and D, male, Depok, Java, July 20.

Holotype, allotype, and paratypes A and B in National Museum; paratypes C and D returned to Bryant.

Type.—Cat. No. 29139, U.S.N.M.

The paratypes show no tangible variation from the holotype.

Chorisoneura lativitrea Walker may belong to this genus, but types must be seen to determine this definitely. But that species is very surely not the one here described.

Family MANTIDAE[5]

Subfamily AMELINAE

DIMANTIS HAANI Giglio-Tos

Dimantis hanni GIGLIO-TOS, Bull. Soc. Ent. Ital., vol. 46, 1915, p. 160.

One male, Pelaboean Ratoe; one male, Depok, August 1.

In the specimen from Pelaboean Ratoe the tegmina and pronotum are more flecked with blackish than is noticeable in the Depok specimen.

Subfamily CALIRIDINAE

LEPTOMANTIS ALBELLA Burmeister

Mantis albella BURMEISTER, Handb. Ent., vol. 2, 1838, p. 533.

One female, Pelaboean Ratoe.

Subfamily DEROPLATINAE

DEROPLATYS DESICCATA Westwood

Deroplatys desiccata WESTWOOD, Mod. Class. Ins., vol. 1, 1839, p. 430.

One female, Depok, July.

Subfamily HYMENOPODINAE

CREOBROTER DISCIFERA Serville

Mantis discifera SERVILLE, Ins. Orth., 1839, p. 161.

One female, Buitenzorg, March; one female, Soekaboemi, March 25.

HYMENOPUS CORONATUS Olivier

Mantis coronatus OLIVIER, Enc. Méth., vol. 7, 1792, p. 638.

One female, Buitenzorg, April 25; one female, Depok, August 10, five nymphs of various sizes, Buitenzorg, April and June, and Pelaboean Ratoe.

Subfamily MANTINAE

HIERODULA VENOSA Olivier

Mantis venosa OLIVIER, Enc. Méth., vol. 7, 1792, p. 639.

One female, Depok; four males, four females, four nymphs, Buitenzorg, March and April; also a dozen egg-masses, one with many first-stag nymphs, from Buitenzorg, which very surely belong here.

HIERODULA, species

One male, Tjidobas, Mount Gede, September (4,000 feet altitude); one female, Soekaboemi, March 22; two nymphs, T jibodas, Mount Gede, April 20; one nymph, Buitenzorg, March.

This undetermined species is near the one above determined as *venosa*, but the pronotum is a little more expanded apically and the anterior coxae are more bluntly armed.

[5] The Mantids are herein listed under subfamilies as used by Giglio-Tos.

RHOMBODERA JAVANA Giglio-Tos

Rhombodera javana GIGLIO-TOS, Bull. Soc. Ent. Ital., vol. 43, 1912, p. 103.

One female, Buitenzorg, March; one female, Depok, July.

These specimens are a little larger than the measurements given by Giglio-Tos and the pronotum is slightly narrower in proportion; otherwise they show no variation from the original description of this species.

RHOMBODERA VALIDA Burmeister

Mantis valida BURMEISTER, Handb. Ent., vol. 2, 1838, p. 536.

One male, four females, one female nymph, Buitenzorg, March.

STATILIA MACULATA Thunberg

Mantis maculata THUNBERG, Nov. Spec. Ins., vol. 3, 1784, p. 61.

One male, Pelaboean Ratoe; one female, Buitenzorg, March; one female, Tjibodas, Mount Gede, September (4,000 feet altitude).

TENODERA ARIDIFOLIA Stoll

Mantis aridifolia STOLL, Spectres, Mantes, 1813, p. 65, pl. 22, fig. 82.

One female, one egg-mass, Tjibodas, Mount Gede, September (4,000 feet altitude); one female, Depok, August.

TENODERA FASCIATA Olivier

Mantis fasciata OLIVIER, Enc. Méth., vol. 7, 1792, p. 640.

One male, Buitenzorg, June.

Subfamily TOXODERINAE

PARATOXODERA CORNICOLLIS Wood-Mason

Paratoxodera cornicollis WOOD-MASON, Journ. Asiat. Soc. Bengal, vol. 58, 1889, p. 325.

One female nymph apparently in the last stage, Buitenzorg, April 15.

Family PHASMIDAE

Subfamily ASCEPHASMINAE

ABROSOMA APTERUM Redtenbacher

Abrosoma apterum REDTENBACHER, Ins. Fam. der Phasm., 1906, p. 85, pl. 4, figs. 7, 8.

One male, Buitenzorg, March.

Subfamily NECROSCINAE

ASCELES ADSPIRANS Redtenbacher

Asceles adspirans REDTENBACHER, Ins. Fam. der Phasm., 1908, p. 499.

Two males, Tjibodas, Mount Gede, September (4,000 feet altitude).

LOPAPHUS TRANSIENS Redtenbacher

Candayles transiens REDTENBACHER, Ins. Fam. der Phasm., 1908, p. 539, pl. 26, fig. 7.

Two females, Tjibodas, Mount Gede, September (4,000 feet altitude); two females, one female nymph, same locality, April 20, altitude not stated; one female nymph, Buitenzorg, March.

The tegmina and wings of three of these four adult females are partly torn away in some unknown manner.

ORXINES MACKLOTTII DeHaan

Phasma macklottii DEHAAN, Temminck, Verhandel., Orth., 1842, p. 126, pl. 11, figs. 1, 2.

Fourteen males, three females, Tjibodas, Mount Gede, April 20 (4,000 feet altitude).

SIPYLOIDEA DOLOROSA Redtenbacher

Sipyloida dolorosa REDTENBACHER, Ins. Fem. der Phasm., 1908, p. 547.

One male, Pelaboean Ratoe.

The mesonotum of this specimen is barely granulate, thus deviating somewhat from the description.

Subfamily PACHYMORPHINAE

BACULUM ABLUTUS Brunner

Clitumnus ablutus BRUNNER, Ins. Fam. der Phasm., 1907, p. 190.

Two males, Tjibodas, Mount Gede, September.

This species is referred to the genus *Baculum* on the authority of Karny.[6]

The two specimens here recorded agree very well with published descriptions except that the color is apparently more uniformly brownish.

The left antenna of one of these specimens has been regenerated; it is short and heavy, about one and one-half times as long as the head and comprises but seven segments; the other antenna of this specimen is broken off rather short, and from the second specimen the antennae are both broken off. The prevalence of regenerated antennae in these long-horned insects, which are less than the natural length of these organs, together with the very general imperfect condition of the antennae, make the differentiation of the subfamily Pachymorphinae (=Clitumninae of Brunner and Redtenbacher) very difficult indeed.

CUNICULINA NEMATODES DeHaan

Phasma (Bacteria) nematodes DEHAAN, Temminck, Verhandel., Orth., 1842, p. 132, pl. 11, fig. 6.

One male, Pelaboean Ratoe.

[6] Treubia, vol. 3, 1923, p. 235.

EUCARCHARUS INVERSUS Brunner

Eucarcharus inversus BRUNNER, Ins. Fam. der Phasm., 1907, p. 186, pl. 8, fig. 1.

One female, Tjibodas, Mount. Gede, September.

This specimen agrees very well with the original description and figure except that the expansion of the sixth segment of the abdomen appears to be less noticeable.

Subfamily PHASMINAE

PHARNACIA NIGRICORNIS Redtenbacher

Pharnacia nigricornis REDTENBACHER, Ins. Fam. der Phasm., 1908, p. 452.

One male, Buitenzorg, April.

This specimen, which runs out to the above species by Redtenbacher's key, agrees very well with the description except that the antennae are not darker than the rest of the coloration.

Subfamily PHYLLINAE

PHYLLIUM GERYON Gray

Phyllium geryon GRAY, Zoologist, vol. 1, 1843, pp. 118, 121, fig. *a*.

One male, Tjibodas, Mount Gede, September; one female, Buitenzorg, March.

PULCHRIPHYLLIUM PULCHRIFOLIUM Serville

Phyllium pulchrifolium SERVILLE, Ins. Orth., 1839, p. 292.

Six females and three female nymphs, Buitenzorg, March and April.

There are also three eggs in the collection marked as belonging to this species; they are round, the cap forming a protruding ball; the surface is smooth, not beautifully carved as in some of the Phasmidae.

One of the adult females above recorded has the expansion of the anterior femur with the edges entire, or almost so, a variation towards *gelonus* Gray; otherwize it seems typical of *pulchrifolium*.

Subfamily PRISOMERINAE

DIXIPPUS APPETENS Brunner

Dixippus appetens BRUNNER, Ins. Fam. der Phasm., 1907, p. 281.

One male, Soekaboemi, March; one male, Pelaboean Ratoe.

LONCHODES BRYANTI, new species

Description male.—Appears most nearly allied to *S. praon* Westwood. Head with a pair of sharp thorns on the vertex between the eyes connected by a slightly elevated ridge; on the posterior extreme of the dorsal surface of the head is a transverse row of four tubercles, the middle two the larger, and scattered over the sides of the head are a few very minute granules. Antennae extending backward to about the extremity of the second segment of the abdomen and con-

sisting of about thirty distinct segments, most of which are elongate. Eyes subglobular and very prominent. Pronotum above moderately furnished with rather large but low tubercles; meso- and metanotum almost smooth, the former with a few low scattered tubercles; intermediate segment poorly defined, about one-third as long as the metanotum.

Legs rather short, especially the basally curved anterior femora which are no longer than the mesothorax; the legs are unarmed except that the femora have a couple of sharp triangular teeth near the apex on the posterior margin beneath; tibiae about equal in length to their respective femora except the anterior ones which are a little longer; the anterior femora are very slightly undulate dorsally.

Abdomen moderately slender, the basal four segments subequal in length, each about three times as long as broad; fifth segment a little shorter than the previous and the eighth one somewhat shorter than the fifth; seventh and eighth segments decidedly broadened and subequal to each other in length, each being about as long as broad, the seventh broadest posteriorly; ninth segment considerably longer than the preceding one and much narrower, strongly compressed and with the tip fissate; supra-anal plate not evident; operculum triangular, about as long as the segment from which it arises, apically angulate, ventrally carinate and basally noticeably swollen. Cerci ventral, very short, not nearly reaching tip of last abdominal segment.

Female.—Very like the male but less slender and differing in the following particulars: The tubercles of the head and thorax are decidedly larger and more numerous and the abdomen also bears some very low tubercular roughnesses. Anterior femora much more broadened beyond the subbasal sinuation than those of the male. Second segment of the abdomen about one and one-half times as long as broad; ninth segment broadly and briefly notched apically, the lateral angles triangular and projecting backward; supra-anal plate distinct, triangular, the tip pointed and the dorsal surface mesially elevated into a rather high longitudinal carina; operculum a little more elongate than that of the male, more regularly scoop-shaped and carinate ventrally; superior valves of the ovipositor simple and slender, the inferior pair basally expanded and with a fingerlike branch on the outer side; cerci more flattened than those of the male. Color as in the male.

Measurements.—Length, entire insect from front of head to tip of abdomen, male 55, female 58 mm.; antenna, male about 35 mm., broken in female, the longest remaining portion being 24 mm.; mesonotum, male 12, female 13 mm.; metanotum and intermediate segment together, male 8, female 9 mm.; anterior femora, male 12, female 10.5 mm.; intermediate femora, male 9, female 9 mm.; pos-

terior femora, male 12, female 10 mm.; cercus, both sexes about 1 mm.; width by calliper, head across eyes, male 3, female 3.5 mm.; mesonotum mesially, male 1.5, female 2.5 mm.

Holotype.—Male, Tjibodas, Mount Gede, Java, August 26 (7,800 feet altitude); allotype, female, same data as the holotype.

Holotype and allotype in National Museum.

Type.—Cat. No. 29140, U.S.N.M.

LONCHODES OBSTRICTUS Brunner

Lonchodes obstrictus BRUNNER, Ins. Fam. der Phasm., 1907, p. 260.

One female, Buitenzorg, March 18.

This female is placed here provisionally, the species being based on the male sex only.

LONCHODES, species

One male, Tjibodas, Mount Gede, April 20.

This is allied to *abbreviatus* but has the apical segment of the abdomen cleft to the base.

Subfamily THERAMENINAE

DATAMES OILEUS Westwood

Acanthoderus oileus Westwood, Cat. Phasm., 1859, p. 53, pl. 26, fig. 4.

One male, Tjibodas, Mount Gede (4,200 feet altitude).

This specimen agrees almost perfectly with the description and figure in Brunner and Redtenbacher.[7]

Family ARCIDIDAE

Subfamily TETRIGINAE

SCELIMENA PRODUCTA Serville

Tetrix producta SERVILLE, Ins. Orth., 1839, p. 762.

Fourteen males and ten females from Buitenzorg in March, April, and June and one female from Mount Salak at an altitude of 3,000 feet. This fine series shows a range of total length of pronotum from 20 to 22 mm. in the male and 26 to 28.5 mm. in the female. A female from Java in the collection of the U. S. National Museum, presumably determined by Saussure, has a pronotal length of 31 mm.

BOLOTETTIX OCULATUS Bolivar

Criotettix oculatus BOLIVAR, Ann. Mus. Genova, vol. 39, 1898, p. 71.

Two males from Buitenzorg, one in March and one on April 18, and two females from Mount Salak on May 15.

ACANTHALOBUS INORNATUS Walker

Tettix inornatus WALKER, Cat. Derm. Salt. Brit. Mus., vol. 5, 1871, p. 834.

Two females, Buitenzorg in March.

[7] Ins. Fam. der Phasm., 1906, p. 52, pl. 1, fig. 15.

Walker described this as with three lateral spines, but Kirby, who had the type before him for examination, says that this was an optical illusion. Kirby placed the *saginatus* of Bolivar as a synonym of this species, in which he was apparently justified, the only tangible difference noticeable between these Javan specimens and ones determined by Hebard from India being size, those from Java having a pronotal length in the female of 16 mm. while in the Indian specimens this is 17 mm. in the male and 20 to 21 mm. in the females. Bolivar gives 18 mm. as the pronotal length of the female of *saginatus*, being intermediate between the specimens noted above.

ACANTHALOBUS, species

One male from Buitenzorg in March. A very heavy form apparently allied to *robustus* Hancock but having the posterior metatarsus decidedly longer than the apical segment of the tarsus, in which respect it agrees with the macropterous *miliarius* of Bolivar. It is perhaps undescribed, but it is deemed unwise to erect new species in this difficult group from unique specimens.

ACANTHALOBUS, species

Two males of a smaller species than the above are in the collection from Pelaboean Ratoe without date.

SYSTOLODERUS PARVUS? Hancock

Systoloderus parvus? HANCOCK, Trans. Ent. Soc. Lond., 1907, p. 227.

Three females of what is probably this species are in the collection, two from Mount Salak on May 25, and one from Pelaboean Ratoe without date. The isolated description of this species, which makes no mention of certain important characters, makes certain determination impossible. The present specimens have the posterior ocelli located at a point barely if at all below the middle of the eyes, not on a plane with the antero-ventral border of the eyes as stated in the description of *parvus*, thus indicating specific distinctness.

MAZARREDIA CELEBICA Bolivar

Mazarredia celebica BOLIVAR, Ann. Soc. Ent. Belg., vol. 31, 1887, pp. 186, 238, 241.

One male from Buitenzorg in March and a female from Pelaboean Ratoe without date.

EUPARATETTIX PERSONATUS Bolivar

Paratettix personatus BOLIVAR, Ann. Soc. Ent. Belg., vol. 31, 1887, pp. 188, 278.

Six males and five females as follows: Buitenzorg, three females; Mount Salak, six males and one female; Bantar Gebang, one male; Depok, one female.

This is a smaller species than *E. variabilis* as represented by Javan specimens determined by Hebard in the National Museum. The

posterior tibiae of the series of the *personatus* here recorded vary in color from black with a whitish band to unicolorously brown and the pronotal length measures from 8 to 8.5 mm. in the male and 8.5 to 9.5 mm. in the female. The wings noticeably exceed the pronotum in all these specimens.

EUPARATETTIX, species

Two females, Megamendg Mountains.

These are very like *E. personatus* as above determined except the face is more swollen below the antennae from a lateral view and the wings do not exceed the pronotum, which measures 10 mm. in length. The posterior tibiae are black with the bases lighter. On the dorsum above the shoulders there is a pair of longitudinal carinae, one on each side approximately midway between the median and lateral carinae.

EUPARATETTIX, species

A single male specimen of still another species of *Euparatettix* was in the collection, from Pelaboean Ratoe. This specimen is imperfect, having the posterior process of the pronotum broken off. It is more slender than *personatus* and has smoother and more slender posterior femora.

SPADOTETTIX ?, species

A single specimen without antennae and with the greater part of the body eaten away, is in the collection from Buitenzorg, taken in March.

HEDOTETTIX GRACILIS DeHaan

Tettix gracilis DEHAAN, Temminck, Verhandel., Orth., 1842, pp. 167, 169.

A female from Bantar Gebang without date; also a male from Buitenzorg in March which has the pronotal extension apparently somewhat abnormal, causing it to extend but little beyond the tip of the abdomen.

XISTRA ? species

Three females, two from Buitenzorg in March and one from Mount Salak in May.

HYBOELLA INFLATUS Krauss

Coptotettix inflatus KRAUSS, Denschr. Med. Nat. Ges. Jena, vol. 8, 1903, p. 758, pl. 57, fig. 10.

One adult pair and a second female from Tjibodas on April 20, one female from Mount Salak on May 15, and one female from Buitenzorg in March. The frontal costa in these specimens is ventrally expanded to a distance greater than the width of the basal segment of the antenna. These specimens agree very well with the description of *inflatus*, but there is little resemblance between them and the slender forms of the genus and it is doubtful if this species really belongs to *Coptotettix*.

Subfamily EUMASTACINAE

ERUCIUS JAVANUS Burr

Erucius javanus BURR, An. Soc. Espan., vol. 28, 1899, pp. 89, 109, 110.

One mated pair, Tjibodas, Mount Gede, April 20, a female nymph from same locality and an adult male from Buitenzorg in March.

Subfamily ACRIDINAE.

ACRIDA TURRITA Linnaeus

Gryllus (*Acrida*) *turrita* LINNAEUS, Syst. Nat., 10 ed., 1758, p. 427.

One adult male, Mount, Salak, May 15; one large female nymph from Buitenzorg in March and fourteen adult females from Mount Salak, Depok, and Buitenzorg on various dates. The male and five of the females are brown, the others green. The lanceolate supra-anal plate of the immature forms of this species is indeed a remarkable development.

PHLAEOBA FUMOSA Serville

Opsomala fumosa SERVILLE, Ins. Orth., 1839, p. 593.

Five males, 20 females and one female nymph from Buitenzorg, Mount Salak, and Pelaboean Ratoe on various dates from March to June. This series showed very little variation in size or color.

AIOLOPUS, species

An adult male from Buitenzorg in March is referred to the genus *Aiolopus*. It does not appear to be the *A. tamulus* of Fabricius and may perhaps represent an undescribed form.

Subfamily OEDIPODINAE

HETEROPTERNIS OBSCURELLA Blanchard

Oedipoda obscurella BLANCHARD Voy. Pole Sud., Zool., vol. 4, 1853, p. 375.

One male and sixteen females, the male from Buitenzorg and all the females from Mount Salak. The wings of these specimens are more or less yellowish basally, though this is very surely a variable character as some of apparently the same species from the Philippines have the wings basally roseate instead of yellowish. The lateral lobes of the pronotum vary a little in the posterior margin, which ranges from almost straight to noticeably concave; the posterior-inferior angle is rounded, in no way subproduced and acute as described in the works of Saussure for the allied *splendens* of Walker (=*pyrrhoscelis* Stal).

GASTRIMARGUS TRANSVERSUS Thunberg

Gryllus transversus THUNBERG, Mem. Acad. Petersb., vol. 5, 1815, p 233.

Five males, three females, and three female nymphs from Mount Salak, two females from Depok and one female from Buitenzorg. These specimens are essentially like ones of *G. marmoratus* Thunberg in the National Museum collection apparently determined by Saus-

sure; the scutellum of the vertex in all the Javan specimens are, however, less concave and with a very distinct raised longitudinal carina extending its entire length, while in the two specimens of *marmoratus* examined this scutellum is more concave and has a very slight median carina, and that not continuous. These characters, while constant in the Javan series here recorded, are evidently subject to more or less variation, as two males and a female of *G. africanus* Saussure, as determined by Uvarov and now before me, show decided variation in this respect.

TRILOPHIDIA CRISTELLA Stal

Oedipoda cristella STAL, Eug. Resa, Orth., 1860, p. 344.

One male and four females, Buitenzorg; one female, Batavia; one female, Pelaboean Ratoe.

TRILOPHIDIA ANNULATA Thunberg

Gryllus annulate THUNBERG, Mem. Acad. Petersb., vol. 5, 1815, p. 234.

One male, three females, Buitenzorg; one female, Mount Salak; one male, Megamendg Mountains, (4,800 feet altitude); one male, Pelaboean Ratoe.

Superficially this species appears rather similar to *cristella* but is somewhat larger. *Annulata* also has the median carina of the pronotum more profoundly bisected than in *cristella,* though it is rather deeply cleft in both species. The most salient morphological character separating these two species is found on the prozona, where in *annulata* is seen on each side of the disk near the anterior margin a well elevated tubercle while in *cristella* there is but a slight diagonal carina at this point.

Subfamily PYRGOMORPHINAE

AULARCHES PUNCTATUS Drury

Gryllus (*Locysta*) *punctatus* DRURY, Ill. Exot. Ent., vol. 2, 1773, pl. 41, fig. 4.

One male, Buitenzorg in June, and one female, Mount Salak on May 4.

TAGASTA MARGINELLA Thunberg

Tagasta marginella THUNBERG, Mem. Acad. Petersb., vol. 5, 1815, p. 265.

One adult female, without locality label but with an altitude label reading 3,000 feet; also a female nymph from Bantar Gebang. Allowing for sexual differences this adult specimen agrees very well with the description of the male as given by Stal in 1873.[8]

ATRACTOMORPHA PSITTACINA DeHaan

Acridium (*Truxalis*) *psittacina* DEHAAN, Temminck, Verhandel., Orth., 1842, p. 146.

Three adult males and a female nymph from Pelaboean Ratoe and three males from Buitenzorg.

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[8] Rec. Orth., pt. 1, p. 13.

ATTRACTOMORPHA CRENULATA Fabricius

Truxalis crenulata FABRICIUS, Ent. Syst., vol. 2, 1793, p. 28.

Five males, eleven females, and three nymphs from Buitenzorg; three females from Pelaboean Ratoe; one male and a nymph from Megamendg Mountains; one female from Mount Salak; one female from Tjibodas, Mount Gede.

Subfamily CYRTACANTHACRINAE

OXYA VELOX Fabricius

Gryllus velox FABRICIUS, Mant. Ins., vol. 1, 1787, p. 239.

Nine males and twenty-three female adults and one male and four female nymphs, the nymphs and seven of the adults from Buitenzorg, all in March except two males in June, the rest from Mount Salak in May, some at or above 3,000 feet altitude.

Many of these specimens, especially those from Buitenzorg, are much discolored from immersion in spirits.

OXYA RUFIPES? Brunner

Oxya rufipes BRUNNER, Ann. Mus. Genova, vol. 33, 1893, pp. 152, 153.

A single adult female from Buitenzorg in June is referred here. It was collected in spirits and the color is much faded. The last ventral segment of the abdomen of this specimen is without longitudinal carina but it is apically tridentate, a character at variance with the original description and one indicating that this may indeed be *rufipes.* It may perhaps be the little known *obtusa* of DeHaan. It certainly is not the species described by Carl as *O. minuta.*

CARYANDA SPURIA Stal

Acridium (*Oxya*) *spuria* STAL, Eug. Resa, Orth., 1860, p. 336.

One male, Tjibodas, Mount Gede in April, and one male and three females from Buitenzorg in March. The males agree very well with the description of that sex as given by Stal. The antennae are no longer than the head and pronotum together and the basal two segments are yellow, followed apically by reddish fading into brownish; the tegmina are one-half as broad as long, the broadest point being noticeably distad of the middle; in the male specimen the anal area is tinged with greenish, evidently a matter of individual variation. The valves of the ovipositor are rather slender and the margins are furnished with a few dull serrations.

Measurements.—Length, pronotum, male 3.5, female 5 mm.; tegmina, male 3, female 4 mm.; posterior femora, male 9.5, female 14 mm.; width, tegmina at widest point, male 1.5, female 2 mm.

One male and two females of the above lot from Buitenzorg were collected in spirits and thus they are shrunken and have lost much of their natural color.

TAUCHIRA ABBREVIATA Serville

Acridium abbreviata SERVILLE, Ins. Orth., 1839, p. 678.

One male and a female from Buitenzorg and four females from Tjibodas, Mount Gede.

The blue posterior tibiae of this species will serve to distinguish it from the closely allied *T. lucida* of Krauss, which was described from Samarang and Tjibodas but is not represented in the present collection.

VALANGA NIGRICORNIS, var. MELANOCORNIS Serville

Acridium melanocorne SERVILLE, Ins. Orth., 1839, p. 659.—UVAROV, Ann. Mag. Nat. Hist., vol. 12, 1923, p. 352, figs.

Six males, thirteen females, and one male nymph from Buitenzorg.

This series, while rather uniform in size, varies greatly in color; one extreme is uniformly wood-brown and the other with a conspicuous yellowish or yellow-green stripe extending from the fastigium of the vertex along the whole length of the pronotal disk and along the anal area of the tegmina almost to the tip. Various intergrades between these extremes occurs, showing rather conclusively that but a single species is involved. The posterior tibiae vary from pale reddish to yellow.

A single specimen of typical *nigricornis* Burmeister is in the collection, a male taken at Singapore.

CHONDRACRIS ROSEA, var. BRUNNERI Uvarov

Chondracris rosea, var. *brunneri* UVAROV, Ann. Mag. Nat. Hist., vol. 14, 1924, p. 108.

One male, six females, and a female nymph from Buitenzorg. These are a little larger than the types described by Uvarov.

PATANGA SUCCINCTA Johansson

Gryllus (*Locusta*) *succincta* JOHANSSON, Amoen. Acad., vol. 6, 1763, p. 398.—UVAROV, Ann. Mag. Nat. Hist., vol. 9, 1923, p. 143.

One male and seven females, Depok; one male, Soekaboemi; one female, Buitenzorg.

All these specimens have red-tinted underwings except the male from Soekaboemi, which has them transparent to the base; this specimen is also much less variegated in color than the others, having the costal streak of the tegmina, the dorsal stripe of the head, pronotum, and anal area of tegmina and the markings on the lateral lobes of the pronotum very obscure; it resembles very much ones examined from Banks Island and localities near Bombay.

Aside from coloration there is decided structural variation evident in material referred to this species, as the shape of the prosternal spine, the cerci of the male, the supra-anal plate of the same sex, etc.

BIBRACTE DEMINUTA Brunner

Bibracte deminuta BRUNNER, Abhandl. Senckenb. Ges., vol. 24, 1898, pp. 241, 242, pl 18, fig. 38.

Five females and one female nymph from Tjibodas, Mount Gede and one female from Buitenzorg in March.

BIBRACTE HAGENBACHII DeHaan

Acridium hagenbachii DEHAAN, Temminck, Verhandel., Orth., 1842, pp. 153, 154, pl. 21, fig. 2.

Two males, Depok and Pelaboean Ratoe.

COPTACRA FOEDATA Serville

Acridium foedatum SERVILLE, Ins. Orth., 1839, p. 662.

Five females, Buitenzorg; one female, Pelaboean Ratoe; one female and a male nymph, Mount Salak.

TRAULIA FLAVOANNULATA Stal

Acridium flavoannulata STAL Eugen. Resa, Oth., 1860, p. 329.

A single male from Buitenzorg. The posterior legs of this specimen are missing, but there is scarcely a doubt of the correctness of the determination.

CATANTOPS HUMILIS Serville

Acridium humilis SERVILLE, Ins. Orth., 1839, p. 662.

A pair from Buitenzorg in March, collected in spirits and thus much discolored, is refered to this species.

Family TETTIGONIDAE

Subfamily RHAPHIDOPHORINAE

RHAPHIDOPHORA DEUSTA Brunner

Rhaphidophora deusta BRUNNER, Verh. zool.-bot. Ges. Wien, vol. 38, 1888, p. 298.

Thirteen males, eight females, Buitenzorg in March; four males, four females, Mount Salak; one male, Pelaboean Ratoe.

This series ranges in size from large males with the posterior femora 30 mm. long to small ones clearly immature. Some specimens, however, that appear to be adult are decidedly smaller than the size usually given for this species. Except for the unserrated ovipositor, some of the specimens would be referable to *R. fulva* Brunner.

Subfamily GRYLLACRINAE

GRYLLACRIS TIBIALIS Serville

Gryllacris tibialis SERVILLE, Ins. Orth., 1839, p. 393.

One male and three females from Mount Salak, without date, and two females from Buitenzorg in March and April.

GRYLLACRIS SIGNIFERA Stoll

Gryllus (Tettigonia) signifera STOLL, Spectres, Saut., 1813, p. 26, pl. 12*a*, fig. 50.

Four males, two females and two female nymphs from Buitenzorg in March and April; one male from Pelaboean Ratoe; one female from Depok.

GRYLLACRIS FALCATA Brunner

Gryllacris falcata BRUNNER, Verh. zool.-bot. Ges. Wien, vol. 38, 1888, p. 341.

One female, Buitenzorg, March.

GRYLLACRIS RUFICEPS Serville

Gryllacris ruficeps SERVILLE, Ann. Sci. Nat., vol. 22, 1831, p. 139.

One male, Buitenzorg, March; one male, Mount Salak, without date.

GRYLLACRIS PHRYGANOIDES DeHaan

Gryllacris phryganoides DEHAAN, Temminck, Verhandel., Orth., 1842, p. 219.

One female, Buitenzorg, June.

There are also half a dozen undetermined specimens of the genus *Gryllacris* in the collection.

Subfamily COPIPHORINAE

PYRGOCRYPHA SUBULATA Thunberg

Pyrgocrypha sublata THUNBERG, Mem. Acad. Petersb., vol. 5, 1815, p. 271.

One female, Buitenzorg in March.

EUCONOCEPHALUS INDICUS Redtenbacher

Conocephalus indicus REDTENBACHER, Verh. zool.-bot. Ges. Wien, vol. 41, 1891, pp. 382, 408.

One female from Buitenzorg in March and one female from Pelaboean Ratoe without date, both brown in color.

EUCONOCEPHALUS EXTENSIOR Walker

Conocephalus extensior WALKER, Cat. Derm. Salt. Brit. Mus., vol. 2, 1869, p. 329.

One female, Pelaboean Ratoe, without date.

Subfamily AGROECINAE

OXYSTETHUS BREVIPENNIS Redtenbacher

Oxystethus brevipennis REDTENBACHER, Verh. zool.-bot. Ges. Wien, vol. 41, 1891, pp. 441, 443.

One male, Mount Salak, May 15.

Subfamily CONOCEPHALINAE

CONOCEPHALUS MELAENUM DeHaan

Conocephalus melaenum DEHAAN, Temminck, Verhandel., Orth., 1842, pp. 188, 189.

One male from Buitenzorg in March and a female from Bantar Gebang without date. In both of these specimens the posterior femora have but one ventral spine.

CONOCEPHALUS LONGICORNIS Redtenbacher

Conocephalus longicornis REDTENBACHER, Verh. zool.-bot. Ges. Wien, vol. 41, 1891, pp. 496, 513.

One female from Pelaboean Ratoe without date.

CONOCEPHALUS, species

One female nymph from Buitenzorg in March apparently belongs to neither of the above species.

Subfamily LISTROSCELINAE

XIPHIDIOPSIS FALLAX Redtenbacher

Xiphidiopsis fallax REDTENBACHER, Verh. zool.-bot. Ges. Wien, vol. 41, 1891, pp. 531, 532.

One male, Mount Salak, May 15. The pronotal disk of this specimen has a mesial longitudinal yellowish stripe.

HEXACENTRUS MUNDA, var. SIMILIS, new variety

This differs principally from typical *munda* from the Moluccas in having the antennae with the widely separated black bands present only in the apical half of their length instead of their entire length, and by having the posterior margin of the pronotal disk distinctly emarginate, a condition scarcely indicated in the typical form. The glassy oval of the auditory organ of the tegmina is also slightly less elongate in the Javan form. Size as in *munda*. Described from one male from Buitenzorg, Java, in March.

Type in National Museum.

Type.—Cat. No. 27906, U.S.N.M.

HEXACENTRUS UNICOLOR Serville

Hexacentrus unicolor SERVILLE, Ann. Sci. Nat., vol. 22, 1831, p. 146.

One male and one female, Mount Salak, without date; one male, Buitenzorg in March; one female, Depok, August 1. Also two female nymphs probably belonging here, a medium sized one from Pelaboean Ratoe without date and a smaller one from Buitenzorg in March.

Subfamily EUMEGALODONTINAE

ELLATODON, new genus

The use of the genus *Eumegalodon* Brongniart for the species *blanchardi* by Kirby[9] is unwarranted. *Emegalodon* was proposed to replace the preoccupied genus *Megalodon* of Brullé, and thus its type is *ensifer*, the same as that of the replaced genus. Being later than Walker's genus *Lesina* the genus *Eumegalodon* falls into synonmy under that genus.

The type of *Lesina* Walker is the species *lutescens* of that author; the type of this species was casually examined some years ago in

[9] Syn. Cat. Orth., vol. 2, 1906, p. 289.

London and was found to be a half-grown nymph with the wings not yet developed, a condition so obvious as to very surely have been recognized by Walker. However, no indication of such immaturity is to be found in his description, and this is not a unique case of this sort of misleading element in the works of that most careless of writers. Whether *lutescens* is a distinct species or a synonym of *ensifer* is a matter of some doubt, but probably the latter.

The fact that *Lesina ensifer* and *lutescens* have the anterior and intermediate femora spined both above and below while the species described by Brongniart as *blanchardi* have them armed only below indicates that Kirby was correct in according the last generic distinctness in his catalogue.[10] But, as shown above, his use of *Eumegalodon* in this connection was wrong, and thus a new generic name is needed for the reception of *Megalodon blanchardi* Brongniart. For this purpose the new generic name *Ellatodon* is here proposed. The relationship of the genera and species above noted is as follows:

Lesina Walker. (Type, *Lesina lutescens* Walker.)
Megalodon Brullé (not Sowerby). (Type, *Megalodon ensifer* Brullé.)
Eumegalodon Brongniart. (Type, *Megalodon ensifer* Brullé.)
1. *Lesina ensifer* Brullé.
2. *Lesina lutescens* Walker.

Ellatodon Caudell. (Type, *Megalodon blanchardi* Brongniart.)
Eumegalodon Kirby (not Brongniart).
1. *Ellatodon blanchardi* Brogniart.

LESINA ENSIFER Brullé

Megalodon ensifer BRULLÉ, Hist. Nat. Ins., vol. 9, 1835, p. 157, pl. 15, fig. 4.

One male, Bantar Gebang, without date.

Subfamily PSEUDOPHYLLINAE

Genus CHLORACRIS Pictet and Saussure

The genus *Pseudophyllus* was established by Serville[11] with a single included species, the *Gryllus Tettigonia neriifolius* of Stoll. According to present rules of nomenclature, specifically covered by paragraph 96 of the Entomological Code and opinion 65 of the International Commission of Nomenclature, this species must be retained as the genotype regardless of misdetermination. The disregard of this principle has given rise to much confusion in this genus. The genus *Cleandrus* of Stal[12] was based on the single species *Pseudophyllus graniger* Serville, a species now generally conceded to be a synonym of *neriifolius* Stoll. Thus *Cleandrus* Stal is a synonym of *Pseudophyllus* Serville, both genera having the same species as type.

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[10] Syn. Cat. Orth., vol. 2, 1906, p. 289.
[11] Ann. Sci. Nat., vol. 22, 1831, p. 143.
[12] Rec. Orth., vol. 2, 1874, pp. 50, 67.

Thus the species listed by Kirby [13] in the genus *Cleandrus* are to be transferred to *Pseudophyllus*, and for the species listed by him [14] under *Pseudophyllus* the genus *Chloracris* of Pictet and Saussure is resurrected. The *Pseudophyllus fortis* of Walker (=*obesus* Stal) is referable to *Chloracris* as the pronotal disk is posteriorly rounded The new alignment as above discussed is as follows:

Pseudophyllus Serville. (Type, *Gryllus* (*Tettigonia*) *neriifolius* Stoll.).
Cleandrus Stal. (Type, *Pseudophyllus graniger* Serville (=*neriifolius* Stoll.)
Species as listed under *Cleandrus* by Kirby [15] except *fortis* Walker (=*obesus* Stal).
Chloracris Pictet and Saussure. (Type *Chloracris brullei* Pictet and Saussure.)
Pseudophyllus Kirby (not Serville). (Type, *Chloracris prasina* Pictet and Saussure.)
1. *Chloracris prasinus* Pictet and Saussure.
2. *Chloracris brullei* Pictet and Saussure..
3. *Chloracris harrisoni* Rehn.
4. *Chloracris fortis* Walker (=*obesus* Stal).

CHLORACRIS PRASINUS Pictet and Saussure

Chloracris prasinus PICTET and SAUSSURE, Icon. Saut. Vertes., 1892, p. 22, pl. 3 figs. 14, 14*b*.

One male and one female from Buitenzorg in March and one female from Mount Salak on May 15 at an altitude of 3,000 feet.

PSEUDOPHYLLUS NERIIFOLIUS Stoll

Gryllus (*Tettigonia*) *neriifolius* STOLL, Spectres, Saut., 1813, p. 11, pl. 4*a*, fig. 11.

One female, Buitenzorg in March.

PSEUDOPHYLLUS TITAN White

Pseudophyllus titan WHITE, Ann. Nat. Hist., vol. 18, 1846, p. 24.

A male and a female, both nymphs, are referred to this species. They are from Buitenzorg, taken in March.

ONOMARCHUS LEUCONOTUS Serville

Pseudophyllcus leuconotus SERVILLE, Ins. Orth., 1839, p. 469.

One male and four females, Depok, August 1; Mount Salak, no date (3,000 feet altitude); and Buitenzorg in March.

Two of these females are what may be considered the typical form, having the tegmina but 25 mm. wide at the middle, the others having the tegmina decidedly broader, 30 in the male and 35 in the female. So different in appearance are the broader winged forms that it seems well to recognize them as a variety, for which the name *latipennis* Pictet and Saussure is available.

[13] Syn. Cat. Orth., vol. 2, 1906, pp. 294, 295. [14] Idem, p. 294. [15] Idem, p. 295

MIOACRIS BREVIFOLIA DeHaan

Locusta (Aprion) brevifolia DEHAAN, Temminck, Verhandel., Orth., 1842, p. 207, pl. 19, fig. 3.

Two females and three nymphs from Tjibodas, Mount Gede, April 20, and Buitenzorg.

GONYATOPUS PILOSUS? Brunner

Gonyatopus pilosus BRUNNER, Monogr. Pseudoph., 1895, pp. 63, 64, pl. 8, fig. 23.

One female, Depok, August 1. Specimen too poor for unquestioned determination.

SATHROPHYLLIA FEMORATA Fabricius

Locusta femorata FABRICIUS, Mant. Ins., vol. 1, 1787, p. 233.

Four females and two female nymphs from Buitenzorg in March and one female from Mount Salak, May 15.

Two of these adult specimens are much lighter in color than the others.

Subfamily MECOPODINAE

MECOPODA ELONGATA Linnaeus.

Gryllus (Tettisonia) elongata LINNAEUS, Syst. Nat., 10 ed., vol. 1, 1758, p. 429.

Eight males, seven females, five male nymphs, and one famale nymph from Mount Salak, Depok, Pelaboean Ratoe, and Buitenzorg.

Four color forms are represented by this series, uniformly brown, brown marked with shining black spots, uniformly green, and green with some black spots.

Subfamily PHANEROPTERINAE

ELIMAEA CURVICERCATA Brunner

Elimaea curvicercata BRUNNER, Verh. zool.-bot. Ges. Wien, vol. 41, 1891, p. 47, 50.

Two males from Mount Salak, one on May 15 and one without date.

ELIMAEA, species

One female from Pelaboean Ratoe without date. This specimen, which is somewhat discolored, is apparently allied to the *E. rosea* of Brunner but differs in several details from the description of that species.

DUCETIA JAPONICA Thunberg

Ducetia japonica THUNBERG, Mem. Acad. Petersb., vol. 5, 1815, p. 282.

Four males, Tjibodas, Mount Gede, September; Mount Salak, no date; Depok, July, and Buitenzorg, June.

SYMMACHIS SUBROSEATA Walker?

Phaneroptera subroseata WALKER, Cat. Derm. Salt. Brit. Mus., vol. 2, 1869, p. 351.

One female, Buitenzorg in March. This specimen fits the description of *subroseata* only fairly well and is thus referred here with some doubt.

ANCHLECHA FENESTRA Fabricius

Locusta fenestrata FABRICIUS, Ent. Syst., vol. 2, 1793, p. 34.

One female, Buitenzorg, April 25.

PSYRA BORNEENSIS Brunner

Psyra borneensis BRUNNER, Monogr. Phaneropt., 1878, pp. 170, 171.

One male in poor condition from Buitenzorg in March.

This specimen, which runs out to this species by Brunner's keys, has the posterior legs missing and is imperfect in various other ways. The tegima are marked rather inconspicuously by two longitudinal rows of small brown spots, and the well-developed tympani are blackish; the cerci are similar to those of *melanonota* except the subapical inner tooth is smaller than in a male of that species determined by Hebard from the Moluccas. The antennae are concolorous with the body in the basal half, beyond becoming blackish with narrow light annulations. From *tigrina* Brunner, the only species described as with maculate tegmina, this specimen differs in various ways and is also decidedly larger, the measurements being as follows: Length, pronotum, 6 mm.; anterior femora, 8 mm.; posterior femora missing; tegima, 46 mm.; width, tegima at middle, 9.5 mm.

PSYRA UNICOLOR Brunner

Psyra unicolor BRUNNER, Monogr. Phaneropt., 1878, pp. 170, 172.

One male, Mount Salak, no date.

This specimen is in rather poor condition, having been badly damaged by museum pests, but all the essential parts are present and agree almost perfectly with the original description.

HOLOCHLORA INDICA Kirby

Holochlora indica KIRBY, Syn. Cat. Orth., vol. 2, 1906, p. 430.

Three males, one female, and a small male nymph from Buitenzorg, March, April, and June.

HOLOCHLORA JAVANICA Brunner

Holochlora javanica BRUNNER, Verh. zool.-bot. Ges. Wien, vol. 42, 1891, pp. 90, 91.

One female, Buitenzorg in March.

HOLOCHLORA VENOSA? Stal

Holochlora venosa STAL, Oefv. Vet.-Akad. Förh., ser. 4, vol. 30, 1873, p. 43.

One female from Buitenzorg in March, evidently collected in spirits.

The basal folds of the ovipositor are black on their dorsal fourth, the only character at variance with Brunner's description of *venosa*, in this particular tending toward *emarginata* and *signata*, with the descriptions of which it agrees no better, however, than with those of *venosa*. The subgenital plate is slightly emarginate apically.

Genera SYMPAESTRIA Brunner and STIBAROPTERA Brunner

There appears to be considerable confusion as to the characters and status of the species of *Sympaestria.* Brunner entered this genus in his keys under the category of forms in which the anterior coxae are spined, while as a matter of fact the coxae are unarmed. Also Brünner described a species from the East Indies as *Stibara cornea* and gave the habitat as Brazil, and one year later[16] he admitted the synonymy of this species with the *Sympaestria nitidifolia* of De Haan from the East Indies, which infers the admission of error in the habitat of *cornea.* Dohrn, in view of the above facts, relegates the genus *Stibara* of Brunner to the synonymy under *Sympaestria,* and describes one new species, *longipes* from Java. It results, however, that, of the four species thus classed in *Sympaestria,* two, *acutiloba* Brunner, the type of the genus, and *truncatilobata* Brunner, have the foramina of the anterior tibiae open on the outer side only, that on the inner side being partly closed, classed as conchate, while in *nitidicoloa* De Haan (=*cornea* Brunner) and *longipes* Dohrn the foramina are open on both faces of the tibiae. As this foraminal character is of generic importance the forms with the foramina open on both sides should be removed from the genus in which they are conchate on the inner side. For these species the generic name *Stibaroptera* of Bolivar, a name made to replace the preoccupied *Stibara* of Brunner, is available. The two genera will thus stand as follows:

I. *Sympaestria* Brunner. (Type, *acuteloba* Brunner.)
(Anterior coxae unarmed; anterior tibiae with foramina open on the outer side only.)
1. *S. acutelobata* Brunner.
2. *S. truncatilobata* Brunner.

II. *Stibaroptera* Bolivar (=*Stibara* Brunner). (Type, *cornea* Brunner.)
(Anterior coxae unarmed; anterior tibiae with foramina open on both sides.)
1. *S. nitidifolia* DeHaan (=*cornea* Brunner).
2. *S. longipes* Dohrn.

SYMPAESTRIA ACUTELOBATA Brunner

Sympaestria acutelobata BRUNNER, Monogr. Phaneropt., 1878, p. 185, pl. 3, figs 52*a*, *b*.

ANEROTA GRACILIS Burmeister

Phaneroptera gracilis BURMEISTER, Handb. Ent., vol. 2, 1838, p. 690.

Seven males and one female, Buitenzorg, March and June; Tjibodas, Mount Gede, April 20, and Pelaboean Ratoe, without date.

XANTIA BORNEENSIS Brunner

Xantis borneensis BRUNNER, Monogr. Phaneropt., 1878, p. 371, pl. 7, fig. 112.

One female, Tjibodas, Mount Gede, April 20.

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[16] See Dohrn, Stett. Ent. Zeit., vol. 8, 1892, p. 72.

There is little doubt of this specimen belonging to this rare and structurally interesting species, the male only of which was known to the describer. The present female seems to agree in every particular with the original description and figure of the male except for size and sexual characters. The ovipositor is curved strongly upward and the dorsal margin is finely serrate in the apical half, or slightly more, and for a much less distance on the lower margin; the serrated portions of the margins are darker than the rest of the surface.

The measurements of this female are as follows: Length, pronotum, 15 mm.; tegmen, 74 mm.; posterior femora, 35 mm.; ovipositor, 13 mm.; width, pronotum posteriorly, 10 mm.; tegmen at middle, 26 mm.; posterior tibia ventrally at middle of expansion, 6 mm.; ovipositor at widest point, 5 mm.

There is clearly an error in Brunners's original measurements of the male, as he gives the pronotal length as but 9 mm. when it must be at least 14 mm.

Family GRYLLILAE

Subfamily GRYLLOTAPINAE

GRYLLOTALPA AFRICANA Beauvois

Gryllotalpa africana Beauvois, Ins. Afr. Amer., 1805, p. 229, pl. 2c, fig. 6.

Two males, seven females, and four nymphs, all from Buitenzorg in March and April, except one nymph from Tjibodas, Mount Gede, at an altitude of 4,500 feet.

This series shows no differences from specimens from Africa. The smallest of the nymphs is apparently in the first stage; it has the anterior tibiae with but three fingers and the posterior tibiae have a preapical pale band.

GRYLLOTALPA HIRSUTA Burmeister

Gryllotalpa hirsuta Burmeister, Handb. Ent., vol. 2, 1838, p. 739.

Four males, three females, and two nymphs from Buitenzorg in March and April.

All the males are brachypterous while all the females have the wings caudate. The males agree with the description of *hirsuta* and the females with that of *longipennis* DeHaan, now a recognized synonym of *hirsuta*.

TRIDACTYLUS PULEX Saussure

Tridactylus pulex Saussure, Rev. Suisse Zool., vol. 4, 1896, p. 419.

One female, Batavia, April 1.

This is decidedly larger than the male, measuring fully 5 mm. in length.

Subfamily MOGISOPLISTINAE

ORNEBIUS, species

One male from Buitenzorg in March, a specimen without legs and apparently immature. It is barely 5 mm. in lergth.

Subfamily GRYLLINAE

NEMOBIUS LUZONICUS Bolivar

Nemobius luzonicus BOLIVAR, An. Soc. Espan., vol. 18, 1889, p. 418.

A single male from Tjibodas, Mount Gede, April 20, is referred to this species. It agrees with specimens from the Philippines.

NEMOBIUS NOVARAE Saussure

Nemobius novarae SAUSSURE, Mem. Soc. Geneve, vol. 25, 1877, p. 83, pl. 11, fig. VII–10.

One male and one female from Pelaboean Ratoe without date, and one female from Mount Salak, May 15, at an altitude of 3,000 feet.

NEMOBIUS HISTRIO Saussure

Nemobius histrio SAUSSURE, Mem. Soc. Geneve, vol. 25, 1877, p. 95.

One male, Buitenzorg, March 7. This specimen is brachypterous and the characters agree with those of *histrio* with the exception that the vertex is mottled instead of longitudinally striped.

BRACHYTRUPES PORTENTOSUS Lichtenstein

Acheta portentosus LICHTENSTEIN, Cat. Mus. Zool. Hamburg, vol. 3, 1796, p. 85.

Nine males, eighteen females, and five nymphs, all from Buitenzorg in March, except one male, three females, and one male nymph from Mount Salak, the females on May 15.

This fine series of specimens shows some variation in size, color, and wing length.

GYMNOGRYLLUS ELEGANS Guerin

Gymnogryllus elegans GUERIN, Belanger, Voy. Ind. Orient., Zool., 1834, p. 495, pl. 9, fig. 1.

Twenty-two specimens of this beautiful cricket were in the collection, representing both sexes and various stages of nymphs. Most of the material was taken at Mount Salak but some at Tjibodas, Mount Gede,

This series is remarkably uniform in size and structure and the only variation in color noticeable is that the pronotal disk is marked with reddish yellow along the posterior margin in a few specimens; this is the case in all the nymphs, indicating it is a nymphal character which sometimes persists in the adult.

GYMNOGRYLLUS PULVILLATUS Saussure

Brachytrypus pulvillatus SAUSSURE, Mem. Soc. Geneve, vol. 25, 1877, p. 124.

Three males, two females, and one female nymph from Buitenzorg in March.

The more robust form, the more pubescent body and femora and the greater number of spines on the posterior tibiae lead to the determination of these specimens to *pulvillatus* rather than *angustus*. *Pulvillatus* was described from Java, though Kirby[17] gives its habitat as Madras.

GRYLLUS MITRARUS Burmeister

Gryllus mitrarus BURMEISTER, Handb. Ent., vol. 2, 1838, p. 734.

One female and two nymphs from Depok in June; one female from Pelaboean Ratoe without date; one nymph from Megamendg Mountains (altitude 4,800 feet).

These specimens are somwhat darker than typical but evidently represent one of the several color phases in which this variable species is known to occur. They agree with no other species of *Gryllus* known to occur in Java.

GRYLLUS CONSOBRINUS Saussure

Gryllus consobrinus SAUSSURE, Mem. Soc. Geneve, vol. 25, 1877, p. 188, pl. 12, fig. xi–4.

One adult pair from Buitenzorg without date.

GRYLLUS BURDIGALENSIS, var. CERISYI Serville

Gryllus cerisyi SERVILLE, Ins. Orth., 1839, p. 342.
Gryllus burdigalensis, var. *cerisyi* SAUSSURE, Mem. Soc. Geneve, vol. 25, 1877, p. 185, pl. 12, fig. xi–3.

One female from Pelaboean Ratoe without date.

GRYLLODES BLENNUS Sau

Gryllodes blennus SAUSSURE, Mem. Soc. Geneve, vol. 25, 1877, p. 215.

One macropterous female from Pelaboean Ratoe without date.

This long-winged specimen has the tegmina decidedly longer than macropterous specimens as described by Bolivar, being 6 mm. in length; otherwise it agrees very well with Bolivar's description, though in general a little smaller.

GRYLLODES HEMELYTRUS Saussure

Gryllodes hemelytrus SAUSSURE, Mem. Soc. Geneve, vol. 25, 1877, p. 208.

One female, Mount Salak, April 4 (2,200 feet altitude); one female, Buitenzorg, without date. The second specimen is moldy and has ovipostor broken off; it is referred here with some doubt. It is somewhat larger than the one from Mount Salak and is macropterous, the tegmina covering fully three-fourths of the abdomen. The one from Mount Salak is brachypterous with tegmina 6 mm. in length, somewhat longer than those of the type.

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[17] Syn. Cat. Orth., vol. 2, 1906, p. 23.

PARALANDREVUS COULONIANUS !

Landrevus coulonianus SAUSSURE, Mem. Soc. Geneve, vol. 25, 1877, p. 273, pl. 14 fig. xxv-1.

One male, Mount Salak, April 4, at an altitude of 2,200 feet; one female, Tjibodas, Mount Gede, April 20.

The tegmina of the female are barely if any over 2 mm. in length and noticeably broader than long; the posterior femora measure 12 mm. in each sex, and the ovipositor is curved upward and is about as long as the posterior femora, or a little longer. The vertex of the head in the male (head of the female missing) is not marked by four lines as noted in the original description.

Subfamily OECANTHINAE

PENTACENTRUS UNIFENESTRATUS, new species

This species is distinguishable from the other members of the genus by having the anterior tibiae with a tympanum on the inner side only.

Description, male (female unknown).—Head yellowish brown with the vertex marked by four longitudinal blackish stripes and the eyes with the lower half darker; maxillary palpi brown, the apical segment distally much expanded, the whole segment about twice as long as the apical width; antennae missing except the basal portion, the longer one about half as long as the body, pale and with some black bands beyond the base. Pronotum moderately transverse, the anterior margin truncate, the posterior margin obtusely angulate, the disk with two longitudinal blackish stripes; lateral lobes about as high as broad, the lower margins rather narrowly rounded and the lateral margins subequally ascending. Abdomen elongate; subgenital plate broad as long, forming a large apically broadly rounded scoop; supra-anal plate much narrower and shorter than the subgenital plate, about as long as broad and apically truncate for about half its width; cerci long and slender, swollen at the base and beyond tapering very gradually to a point.

Legs rather stout, brownish in color with darker maculation, the blackish markings tending to form obscure broad bands; anterior and intermediate metatarsi longer than the other two tarsal segments together, the posterior ones three or more times as long; anterior tibiae noticeably expanded in the basal half and with a very large open foramen on the inner surface, occupying the greater part of the width and one-half the length of the tibia, the outer surface somewhat swollen but without a trace of any tympanum; posterior tibiae bear three spines on each dorsal margin in addition to four or five very small serrations and two long apical calcars on the inner side, the upper one slightly the shorter, and three shorter ones on the outer side, the middle one about twice as long as the others, which are subequal with each other in length; posterior femora swollen for most their length, tapering to their tips, and unarmed.

Organs of flight fully developed; tegmina surpassing the abdomen but falling somewhat short of the tip of the posterior femora, yellowish brown in general color, dorsally marked by a couple of triangular blackish spots and some short transverse bars of the same color and with the costal area suffused with fuscous; wings caudate, colored about as the tegmina, the folded prolongations showing dark spots, the costal area dark.

Measurements.—Length, body to end of tegmina, 9 mm; pronotum, 1 mm.; tegmen, 7 mm.; wings, beyond the tegmina, 4 mm.; anterior femora, 1.75 mm.; posterior femora, 5 mm.; cercus, 3.75 mm.; width, pronotum, 1.75 mm.; posterior femora at widest point, 1.5 mm.

Type, female, Mount Salak, Java, May 15 (3,000 feet altitude); paratype same locality and date but without altitude label.

Type in National Museum; paratype returned to Doctor Bryant.

Type.—Cat. No. 29141, U.S.N.M.

XABEA DECORA Walker

Xabea decora WALKER, Cat. Derm. Salt. Brit. Mus., vol. 1, 1869, p. 109.

One very small nymph from Mount Salak.

The unarmed posterior tibiae and the shape of the pronotum of this remarkable cricket are seemingly as apparent in the nymph as in the adult. The extremely long and slender posterior metatarsus, being about three times as long as the combined length of the other two tarsal segments, is a noticeable feature of this small nymph.

Subfamily TRIGONIDIINAE

PARATRIGONIDIUM JAVANICUS, new species

Description, female (male unknown).—Antennae yellowish, basally darker, the second segment black; front of head fuscous, the eyes lighter and the occiput and rest of the head yellow. Pronotum yellow with the anterior margin narrowly bordered with black. Tegmina unicolorously black. Legs uniformly yellow. Abdomen black except the cerci, the subgenital plate and part of the preceding ventral segment, which are yellow; ovipositor rather slender, curved strongly upward and yellowish basally, somewhat darker apically.

Measurements.—Length, body exclusive of ovipositor, 5 mm.; pronotum, 9 mm.; tegmina, 3 mm.; posterior femora, 5 mm.; ovipositor, 2 mm.

Type, female, Pelaboean Ratoe, Java, without date.

Type in National Museum.

Type.—Cat. No. 27331, U.S.N.M.

PARATRIGONIDIUM COLORATUM, new species

Description, female (male unknown).—Antennae blackish with the first two segments yellowish, the apical portion broken off. Head, legs and abdomen colored as described under the above species; the

pronotum uniformly black both on the disk and lateral lobes; tegmina black with the anal margins rather broadly margined with yellow.

Measurements.—Length, exclusive of ovipositor, 5.5 mm.; pronotum, 1 mm.; tegmina, 3.5 mm.; posterior femora, 5 mm.; ovipositor, 2 mm.

Type, female, Pelaboean Ratoe, Java, without date.

Type in National Museum.

Type.—Cat. No. 27332, U.S.N.M.

It is probable that one or both of the above described forms are but color phases of other species.

CYRTOXIPHA LATERALIS Walker

Eneoptera lateralis WALKER, Cat. Derm. Salt. Brit. Mus., vol. 5 suppl., 1871, p. 11

One male, Pelaboean Ratoe.

This specimen agrees very well with Walker's description. The infuscation of the pronotal disk is gathered rather roughly into an apical, an intermediate and a posterior transverse band. Walker describes this species from Bombay, but in Kirby's catalogue the locality is listed as Ceylon.

CYRTOXIPHA RITSEMAE Saussure

Cyrtoxiphus ritsemae SAUSSURE, Mem. Soc. Geneve, vol. 25, 1878, p. 478, pl. 17, fig. xlix-3; pl. 19, fig. lxxix-3.

One male, Pelaboean Ratoe.

This individual agrees almost perfectly with the description of *ritsemae*.

CYRTOXIPHA RITSEMAE, var. OBLITERATA, new variety

The brachypterous insect recorded and figured by Brunner from Burma[18] as questionably belonging to *ritsemae* really represents a distinct variety. Specimens of this form are in the National Museum from Japan, and it is one of the forms treated as *ritsemae* by Shiraki in his Monograph Gryllidae of Formosa in 1911. The most evident difference between this variety and typical *ritsemae* is the somewhat broader form and the very obscure maculation of the tegmina of the male in the Asiatic insect. Deeming this form worthy of a varietal name it is here christened as *Cyrtoxipha ritsemae*, var. *obliterata*, new variety. This name is based on two males and three females from Japan.

Type, male; allotype, female; and paratypes *a*, *b*, and *c*.

Type material in National Museum.

Type.—Cat. No. 29142, U.S.N.M.

[18] Ann. Mus. Genova, vol. 33, 1893, p. 211, pl. 6, fig. 77.

Subfamily ENEOPTERINAE

ITARA MICROCEPHALUS DeHaan

Gryllus (Phalangopsis) microcephalus DEHAAN, Temminck, Verhandel. Orth., 1842, p. 236.

One male, Mount Salak; one female, Pelaboean Ratoe; one female, Buitenzorg in June.

These specimens are a little smaller than the measurements given in the original description of the species but they otherwise agree with the description and figures of Saussure.

MADASUMMA HOFMANNI !

Calyptotrypus hofmanni SAUSSURE, Mem. Soc. Geneve, vol. 25, 1878, p. 569, pl. 18, fig. lxii–2; 2a.

One male, Mount Salak (3,000 feet altitude).

Kirby[10] gives the habitat of this cricket as Borneo but the original description gives it as from Java.

EUSCYRTUS HEMELYTRUS DeHaan

Gryllus (Eneoptera) hemelytrus DEHAAN, Temminck, Verhandel., Orth., 1842, p. 231, pl. 20, fig. 2.

One female; one female nymph from Buitenzorg in March.

These are decidedly smaller than specimens in the National Museum from Japan, but they are clearly much shrunken, evidently from having been originally preserved in spirits. The appendages are mostly broken off these two specimens.

APHONOMORPHUS CINEREUS DeHaan

Gryllus (Eneoptera) cinereus DEHAAN, Temminck, Verhandel., Orth., 1842, p. 232, pl. 20, fig. 5.

One male nymph from Mount Salak on May 5.

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[10] Syn. Cat. Orth., vol. 2, 1906, p. 95.

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V

A NEW PARASITIC NEMATODE FROM AN UNKNOWN SPECIES OF BAT

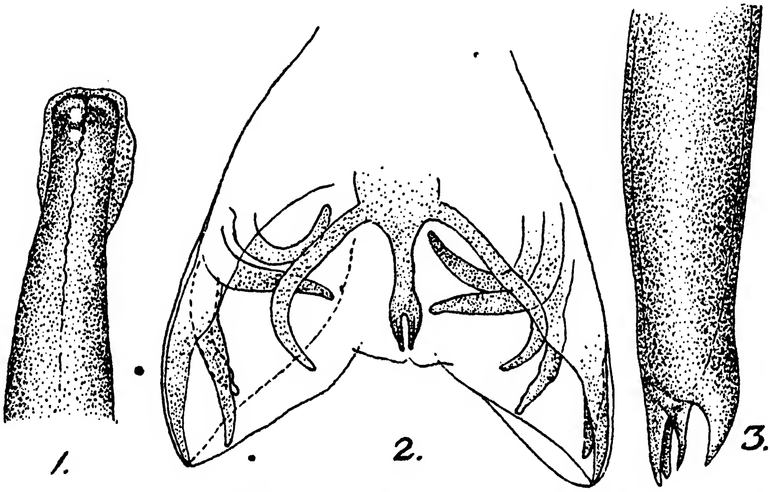
By Benjamin Schwartz,
Of the Bureau of Animal Industry, United States Department of Agriculture

In a collection of specimens forwarded to the Bureau of Animal Industry in the Department of Agriculture by Dr. E. W. Price from College Station, Texas, there were found a few specimens of trichostrongyles from the intestine of an unknown genus and species of bat, which are considered to be a new species of the genus *Anoplostrongylus* Boulenger 1926. This is the first record of the occurrence of this nematode genus in the United States, the other two known species of the genus occurring respectively in Belgium and Brazil. The name *Anoplostrongylus delicatus* is proposed for the species from the United States.

ANOPLOSTRONGYLUS DELICATUS, new species

Diagnosis.—Characters of the genus. Male 4.25 mm. long by 120 μ in maximum width. The diameter of the head excluding the cuticular expansion is 21 μ. The cephalic cuticular expansion is from 46 to 50 μ long by about 38 μ wide. The esophagus is club-shaped, the anterior narrower portion being almost twice as long as the broader posterior portion. The total length of the esophagus is 350 μ, its diameter in the middle of the anterior narrower portion being 17 μ and its maximum diameter in the posterior portion being about 33 μ. The bursa spread out is 227 μ wide. The ventro-ventral ray is longer and narrower than the latero-ventral ray, these rays being divergent and their tips being separated by a distance of about 42 μ. The tip of the latero-ventral ray is more or less falcate. The tip of the externo-lateral ray which diverges from the common stem of the other two lateral rays terminates in an elongated knob. The postero-lateral ray is narrower and somewhat shorter than the medio-lateral ray, the tips of these rays being about 21 μ apart. The externo-dorsal rays are relatively long and terminate in knoblike tips. In the spread out

bursa the tips of the externo-dorsal rays are 122 μ apart. The dorsal ray, which is about 60 μ long, divides into two branches in its posterior third, each of the branches being more or less indistinctly divided. The terminal division is unequal, the outer terminal branches being shorter than the inner terminal branches. The spicules are slender, becoming gradually attenuated, and are 170 μ long. The proximal ends



FIGS. 1-3.—ANOPLOSTRONGYLUS DELICATUS. 1. ANTERIOR PORTION OF BODY; 2. MALE BURSA: 3. FEMALE TAIL.

of the spicules are separated by a distance of 58 μ. The gubernaculum is 55 μ long. Female 5.7 mm. long by about 95 μ in maximum width. The head is 33 to 36 μ wide. The cephalic cuticular expansion is transversely striated, 70 μ long by about 47 μ wide. The esophagus is 352 μ long by 25 μ wide in its anterior narrower portion and about 50 μ in maximum diameter in its posterior portion. The vulva is located at

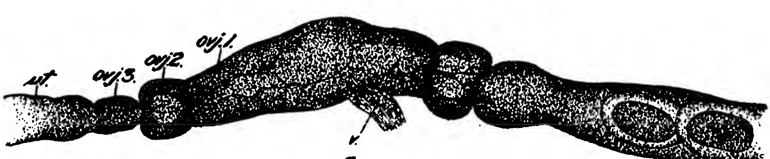


FIG. 4.—ANOPLOSTRONGYLUS DELICATUS. OVEJECTORS AND UTERUS. *ovj. 1.*, OVEJECTOR 1; *ovj. 2.*, OVEJECTOR 2; *ovj. 3.*, OVERJECTOR 3; *ut.*, UTERUS; *v.*, VAGINA.

a distance of 1.45 mm. from the posterior extremity. The ovejectors are well developed, their combined lengths being 403 μ. The eggs are from 63 to 75 μ long by 42 μ wide. The tail terminates in a slender tip and has three terminal spikelike processes of which the dorsal one is more slender than the two ventral ones. The tail is from 84 to 110 μ long.

Host.—"Brown bat," genus and species unknown.

Locality.—College Station, Texas.

Location.—Intestine.

Type.—U.S.N.M. No. 27138. *Paratypes*. U.S.N.M. No. 27199.

The genus *Anoplostrongylus* has close affinities with the genus *Histiostrongylus*, from which it has been recently separated by Boulenger (1926). The latter proposed the genus *Anoplostrongylus* on the basis of *Histiostrongylus paradoxus* Travassos, 1918, and assigned to it *Strongylus tipula* van Beneden, 1873 (*Histiostrongylus tipula* Travassos, 1918). It should be noted in this connection that Travassos (1921) observed certain differences between *Histiostrongylus coronatus* of Molin and his own species, *H. paradoxus*, the most important of these being the absence of spines in the cephalic dilatation of *H. paradoxus*, and the occurrence of three spikelike processes on the tail in *H. paradoxus*, in contrast to the single spike in *H. coronatus*. He also noted that the spicules in his species have barbed distal extremities whereas in Molin's species the tips of the spicules are trifurcated. Despite these important differences between the two species, Travassos did not consider it desirable to establish a new genus for his species, but he stated that a reexamination of Molin's species would be necessary to establish the generic characters of the genus *Histiostrongylus*.

Recently Boulenger (1926) described a new trichostrongyle from *Taphozous perforatus* from Egypt, which is generically identical with *H. coronatus* of Molin. On the basis of these two species Boulenger has given a generic diagnosis of the genus *Histiostrongylus* which leaves no room for doubt that *H. paradoxus* Travassos represents a new genus. As has already been said Boulenger proposed the name *Anoplostrongylus* for the latter genus and assigned *Strongylus tipula* (*H. tipula*) to that genus.

On the basis of the three species of *Anoplostrongylus*, the genus may be defined as follows:

Trichostrongylidae with cuticle of head expanded forming a well-marked cephalic dilatation. Mouth cavity small, leading into a club-shaped esophagus. Female with vulva in the posterior third of the body, with well-developed ovejectors and divergent uteri. Tail short, ending in a slender tip and also provided with three spikelike processes. Male with a well-developed bursa, the latter with large lateral lobes and a small dorsal lobe. The ventro-ventral and latero-ventral rays more or less divergent; medio-lateral and postero-lateral rays with a common stem, close together, the externo-lateral ray diverging from them. Externo-dorsal rays relatively long, dorsal ray bifurcating distally. Spicules slender gradually attenuated. Gubernaculum present.

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O

ORTHOPTEROID INSECTS FROM THE MARITIME PROVINCE OF SIBERIA

By A. N. Caudell

Of the Bureau of Entomology, United States Department of Agriculture

In July and August, 1923, Prof. T. D. A. Cockerell and his wife collected insects at and about Vladivostok in Siberia and at various localities for a distance of some four hundred miles northeast of that place. An interesting account of this excursion appears on pages 415–433 of the *Scientific Monthly* (vol. 29, 1924). The following report is on the Orthopteroid insects taken on the above trip, all of which are deposited in the United States National Museum.

Order DERMAPTERA

Family FORFICULIDAE

Subfamily Forficulinae

ANECHURA ATHYMIA Rehn

Apterygida athymia Rehn, Proc. U. S. Nat. Mus., vol. 27, 1904, p. 540.

One adult male from Kongaus in August and one nymph from Okeanskaya, also in August.

This male agrees structurally with one from Soochow, China, determined as this species, but the color is noticeably darker. The nymph here recorded has the abdomen missing.

FORFICULA TOMIS Kolenati

Chelidura tomis Kolenati, Melet. Ent., vol. 5, 1846, p. 74, pl. 17, fig. 6*a*.

One male, Kongaus in August.

FORFICULA VICARIAE Semenov

Forficula vicariae Semenov, Rev. Russ. d'Ent., vol. 2, 1902, pp. 99, 100, fig. 1.

Two males, Kongaus in August. Also a female nymph of a *Forficula* which may perhaps belong to this species was taken at Low Lighthouse, a hundred miles or so north of Kongaus, on July 13.

Order ORTHOPTERA

Family BLATTIDAE

Subfamily PSEUDOMOPINAE

BLATTELLA GERMANICA Linnaeus

Blatta germanica LINNAEUS, Syst. Nat., ed. 12, vol. 1, 1767, p. 668.

One female, Kongaus in August. Professor Cockerell also brought home a male from Japan. This latter specimen, together with six others from Japan now in the National Museum collection, exhibits decided variation in size and in pronotal coloration, the median stripe of the pronotal disk being continuous to the posterior margin in some specimens while in others it falls noticeably short of that margin, and in some specimens, especially noticeable in one female examined, this stripe is narrower than common, being about as in Indian specimens determined by Mr. Hebard as *Blattella cognata* Brunner.

Family ACRIDIDAE

Subfamily TETRIGINAE

ACRYDIUM SIBERICUM Bolivar

Tettix sibericus BOLIVAR, Ann. Soc. Ent. Belg., vol. 31, 1887, pp. 187, 258, 265.

Three females, one from Amagu on the Kudia River in July and two from Okeanskaya in August.

ACRYDIUM FULIGINOSUM ? Zetterstedt

Acridium fuliginosum ZETTERSTEDT, Fauna Ins. Lapp., vol. 1, 1828, p. 452.

One female nymph from Amagu on the Kudia River perhaps belongs here. The fastigum of the vertex extends decidedly further anterior of the eyes than in the specimens determined above as *sibericum*.

Subfamily ACRIDINAE

PODISMOPSIS USSURIENSIS Ikonnikov

Podismopsis ussuriensis IKONNIKOV, Ann. Mus. Zool. St. Petersb., vol. 16, 1911, p. 246.

Two males in July, one at Preobrageniya Bay and one at Barhatnaye near Kongaus, and one female at Kongaus in August.

GOMPHOCERUS SIBERICUS, var. KUDIA, new variety

Male.—Structurally very much like typical *sibericus*, with the anterior tibiae greatly swollen, as characteristic of that form. The size is, however, so much greater that a varietal name seems almost a necessity. The thorax in the two specimens examined is almost black, much darker than usual in typical *sibericus*, but this is perhaps subject to variation.

Measurements.—Length, pronotum, 5.5 mm.; antennae, about 10 mm.; posterior femora, 12 mm.; tegmina, 19 mm.

Type locality.—Amagu on the Kudia River, Siberia.

Described from two males, type and paratype, collected by T. D. A. Cockerell in July, 1923.

Type.—Cat. No. 29212, U.S.N.M.

A female nymph bearing the same data as the type probably belongs here.

MEGAULACOBOTHRUS KONGAUSENSIS, new species

Male.—Superficially very like *Megaulacobothrus fuscipennis* Caudell, but is smaller, the tip of the abdomen not red and the tegminal vena-

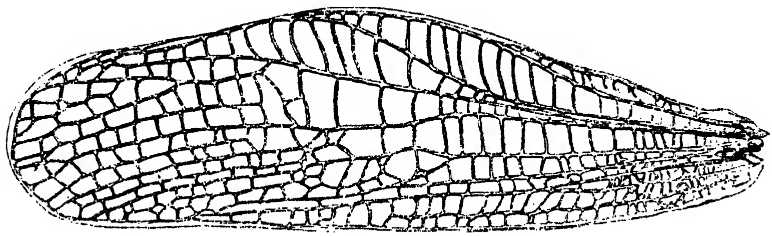

FIG. 1.—TEGMEN OF M. KONGAUSENSIS, NEW SPECIES

tion very different. The anterior radial vein of the tegmen diverges suddenly from the posterior one a little basad of the middle and extends to the anterior edge of the tegmen; figure 1 shows the tegmen of this new species while figure 2 shows that of *fuscipennis*. The wings are similar in the two species, being uniformly and rather

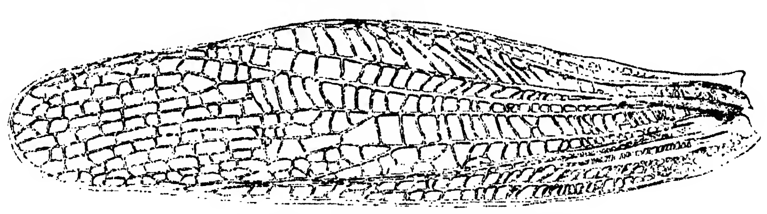

FIG. 2.—TEGMEN OF M. FUSCIPENNIS CAUDELL

deeply fuliginous, a feature suggested by the name *fuscipennis* but unfortunately omitted from the original description of that species.

The posterior tibiae are yellowish in the new species now under discussion, instead of red as in *fuscipennis*, and the posterior femora are yellow with the geniculations black.

Measurements.—Length, pronotum, 4 mm.; antennae, about 12 mm.; tegmina, 19 mm.; posterior femora, 11 mm.; width, tegmina at widest point, 5.25 mm.

Type locality.—Kongaus, Siberia.

Described from three adult males, type and paratypes, collected by T. D. A. Cockerell in August.

Type.—Cat. No. 29213, U.S.N.M.

STAURODERUS BIGUTTULUS Linnaeus

Gryllus locusta biguttulus LINNAEUS, Syst. Nat., ed. 10, vol. 1, 1758, p. 433.

Three males, Kongaus in August; one female, Okeanskaya in August.

Subfamily CYPTACANTHACRINAE

PRUMNA PRIMNOA Fischer von Waldheim

Podisma primnoa FISCHER VON WALDHEIM, Orth. Ross., 1846, p. 248.

Four males and five females, the males and one female at Kongaus in August, two females at Okeanskaya in August, and two females at Amagu on the Kudia River in July.

PODISMA PARVULA Ikonnikov

Podisma parvula IKONNIKOV, Ann. Mus. Zool. St. Petersb., vol. 16, 1911, p. 260' pl. 5, fig. 3.

One male, Kongaus in August. Also an immature specimen from Amagu on the Kudia River which may belong to this species. The adult male agrees with specimens of that sex in the National Museum determined by Ikonnikov except that the pronotal disk is not notched posteriorly.

PODISMA FRIGIDA Boehman

Gryllus frigidus BOEHMAN, Oefv. Vet.-Akad. Förh., 1846, p. 80.

One female from Amagu on the Kudia River in July is referred here, though the tegmina are unusually long, measuring 16 mm. in length.

EIRENOPHILUS DEBILIS Ikonnikov

Eirenophilus debilis IKONNIKOV, Ann. Mus. Zool. St. Petersb., vol. 16, 1911, p. 265, pl. 5, figs. 5, 6.

One male, Kongaus in August, and two females, Okeanskaya in August.

Family TETTIGONIIDAE

Subfamily DECTICINAE

GAMPSOCLEIS SEDAKOVII Fischer von Waldheim

Decticus sedakovii FISCHER VON WALDHEIM, Orth. Ross., 1846, p. 161, pl. 28, figs. 2, 3.

One male, Amagu on the Kudia River in July.

Gampsocleis tamerlana Burr, *G. spinulosa* Krauss, *G. sowinskyi* Adelung, *G. kraussi* Adelung, and *G. kraussi*, var. *baicalensis* Adelung are listed as synonyms of this species. Burr, in his original description

of *tamerlana*, states that the cerci of the male are armed mesially with a large obtuse inner spine, but Uvarov, who studied the type of that species, relegates it to the synonymy under *sedakovii* and figures the cerci of the latter as with the inner tooth decidedly basad of the middle, which agrees with the specimen here recorded, the cercus of which is intermediate between those figured by Uvarov[1] for *G. kraussi* and *G. kraussi*, var. *baicalensis*. The range of variation in the cercal shape as brought out by Uvarov in the above-noted figures would seem to indicate that this character is scarcely more dependable for specific differentiation than those of femoral armature, shape of subgenital plate, and others which that writer decries as unreliable or as of no importance whatsoever.

PARADRYMADUSA SIBERICA, new species

This is a brachypterous form running out to this genus but apparently not agreeing with any described species occurring in the region covered by this report. The diagnostic characters allocating this species generically are as follows: Anterior tibiae armed dorsally with an outer apical spine; prosternum armed with a pair of short spines; posterior tibiae armed apically beneath with four spurs; tegmina not exceeding the tip of the abdomen; pronotum moderately produced posteriorly, without median carina; ovipositor curved gently downwards; plantula of posterior tarsus quadrate, less than half as long as the basal segment of the tarsus; anal dorsal segment of the male posteriorly emarginate and the cerci short.

Male and female.—Head equal in width with the pronotum; vertex as broad as the basal segment of the antenna, beneath meeting the facial fastigium, dorsally narrowly sulcate longitudinally; eyes of moderate size, in the male a little more circular and noticeably more prominent than in the female; antennae long and slender. Pronotum with the disk flat, without median carina, the lateral carinae very rounded, almost obsolete anteriorly and bowed inwards anterior of the middle, the disk thus broarder anteriorly and posteriorly, broadest behind; posterior margin of disk very broadly rounded, or subtruncate, the anterior margin subtruncate or very slightly concave; lateral lobes subvertical and well developed, being about as deep as long, the margins slanting, the anterior ones very slightly so and the posterior ones very much so; humeral sinus barely indicated; prosternal spines short, varying from scarcely longer than the basal width to decidedly elongate. Abdomen with the last dorsal segment of the male posteriorly mesially roundly notched, in the female bent downwards and concave; subgenital plate of the male as long as

[1] Trans. Ent. Soc. Lond., 1924, p. 519, figs. C, D.

broad, beneath basally sulcate longitudinally and laterally bicarinate anteriorly, apically furnished with a pair of obscurely segmented styles about five times as long as broad, the posterior margin of the plate between the styles nearly straight; subgenital plate of the female transverse, posteriorly broadly triangularly notched; cerci of both sexes short, about twice as long as basally thick, in the female cylindrical and simple, tapering to a rather sharp and gently incurved point, in the male more abruptly tapering apically to a sharp and abruptly incurved tooth and armed with a small triangular point near the base of the apical tooth on the dorsal flange formed by the flattened inner surface of the cercus; ovipositor longer than the body and curving gently downwards, the tip rather abruptly tapering, more on the dorsal margin, to a sharp point.

Legs rather slender; plantula of posterior tarsi no longer than broad, less than one-half as long as the basal tarsal segment; anterior tibiae with three dorsal spines on the outer margin, one apical, one mesial and one at the apex of the conchate foramen, and with a single apical spine on the inner margin, beneath armed with six long spines on each margin; middle tibiae with four spines on each dorsal margin and six or seven on each ventral margin; posterior tibiae armed above and below on both margins, above armed nearly to the base, the apical pair of spines much the longest, and beneath armed for a lesser distance with smaller spines, the apical ventral calcars four in number, the inner pair about one-half as long as the outer pair; anterior and intermediate femora unarmed above, beneath unarmed or armed with from one to three small teeth on the caudal margin; posterior femora long, greatly swollen in the basal third, beyond more slender and armed beneath on each margin with several short, sharp black teeth.

Tegmina short and broad in both sexes, not or but little longer than the pronotum, apically broadly rounded, in the female but little overlaping above, in the male strongly so; stridulating tympanum of the male well developed; wings narrow, slightly more than one-half as long as the tegmina.

Measurements.—Length, pronotum, male 7 mm., female 7.25 mm.; tegmina, male 11 mm., female 8 mm.; posterior femora, male 25 mm., female 26 mm.; ovipositor, 28 mm.; width, pronotum posteriorly, male 4.5 mm., female 5 mm.; posterior femora at widest point, male 4 mm., female 4.5 mm.

Type locality.—Kongaus, Siberia.

Described from one male and three females, all adults, taken by T. D. A. Cockerell in August, 1923.

Type, male; allotype, female; paratypes A and B, females.

Type.—Cat. No. 29214, U.S.N.M.

Subfamily CONOCEPHALINAE

CONOCEPHALUS LONGIPENNIS Haan

Locusta (Xiphidium) longipennis HAAN, Temminck Verhandel., Orth., 1842, p. 189.

Two adult females, Kongaus, and one adult female and an immature male, Okeanskaya, all in August.

Subfamily PHANEROPTERINAE

Genus ?? Species ??

One female nymph, Okeanskaya in August.

This specimen is too immature for even generic determination. It is evidently a long-winged form and the ovipositor is broad and short.

Family GRYLLIDAE

Subfamily GRYLLINAE

GRYLLUS DESERTUS Pallas

Gryllus desertus PALLAS, Reisen Prov. Russ. Reiches, vol. 1. 1771, p. 468.

One female nymph, Okeanskaya in August.

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LARGER FORAMINIFERA OF THE GENUS LEPIDOCYCLINA RELATED TO LEPIDOCYCLINA MANTELLI

By T. Wayland Vaughan

Of the Scripps Institution of Oceanography, La Jolla, California

This paper contains a description of a new species of *Lepidocyclina*, *L. forresti*, from the Oligocene of Antigua, a description of a variety of *L. mantelli*, and notes on *L. mantelli*, *L. supera*, and *L. miraflorensis*, with illustrations of each of the species enumerated. All of these species belong to the subgenus *Lepidocyclina* in which the two initial embryonic chambers are characteristically of equal or subequal size and are separated by a straight wall. All the species here considered have hexagonal, subhexagonal, or more or less spatulate equatorial chambers.

All the described and figured specimens are the property of the United States National museum.

LEPIDOCYCLINA (LEPIDOCYCLINA) FORRESTI, new species

Plate 1, figs. 1–4, Plate 2, figs. 1–6

1920. *Lepidocyclina gigas* Cushman (part), U. S. Geol. Survey Prof. Pap. 125 p. 63, pl. 19, fig. 4 (not figs. 1–3).

Description of cotypes, from east of Lynch Point, Willoughby Bay, Antigua.—Test thin, waferlike, with or without a very small umbo. Diameter of microspheric form 18 mm.: diameter of the macrospheric form ranges from about 9 to about 13 mm. Thickness through the center of the macrospheric form 0.75 mm. The surface of the cotypes is smooth, obscurely reticulate, entirely without papillae, except that a few small ones are present on the umbos of some specimens.

Embryonic chambers nearly equal, separated by a straight wall; outer wall moderately thick, about 0.025 mm.; greater diameter of the embryonic apparatus 0.60 mm., lesser diameter, 0.45 to 0.5 mm.

Equatorial chambers spatulate; either the radial or tangential diameter may be somewhat the longer. The radial diameter in the macrospheric form ranges from 0.075 to 0.10 mm., usually about

0.075 mm. As seen in a vertical section the chambers increase in height toward the periphery. In the macrospheric form, height next the embryonic chambers, about 0.05 mm., at the periphery 0.10 mm.

The number of layers of lateral chambers over the center in the macrospheric form on each side of the equatorial chambers, is 6 or 7, and decreases toward the periphery, there being for a distance of about 1.55 mm. from the margin no lateral over the equatorial chambers. The length of the chambers exceeds the height, with only obscure division into tiers. Pillars are absent or only weakly developed.

Description of paratypes from Long Island, Antigua (pl. 1, fig. 4, pl. 2, figs. 3–5).—*Lepidocyclina forresti* appears to be abundant in material from Long Island, Antigua. According to thin sections, which seem to represent the microspheric form (pl. 1, fig. 4; pl. 2, figs. 4–5), the thickness through the center is as much as 1.75 mm., and there are as many as 16 layers of lateral chambers on each side of the equatorial layer. Several specimens possess small papillae on the umbo. The macrospheric specimens are similar to the cotypes.

Localities and geologic horizon.—The cotypes are from material collected by W. R. Forrest, of Saint John, Antigua, on a small point about 5,300 feet east of Lynch Point, and about 1,000 feet west of the base of Hudson Point at an altitude of 15 to 20 feet above sea level. The rock is a cream-colored, finely granular limestone, packed with specimens of the species of *Lepidocyclina* described above. Mr. Forrest has sent me notes on the exposures between Soldier Point and Lynch Point, but the precise position in the section is not clear because of faulting and tilting or folding. The horizon is higher than that of the exposures west of Lynch Point, and Mr. Forrest thinks that it may be above the horizon of *L. canellei* and *L. vaughani* exposed in Half Moon Bay on the north side of Soldier Point, but he is not certain of this relation.

Other localities, Long Island, Antigua, collected by W. R. Forrest; Rifle Butts, Antigua, U. S. G. S. No. 6854, collected by T. W. Vaughan. The specimen from the last-cited locality was referred by Doctor Cushman to *L. gigas*. Oligocene, Antigua formation. The species appears to have considerable stratigraphic range within the Antigua formation.

Affinities.—*Lepidocyclina forresti* belongs in the same group of species as *L. mantelli* (Morton), *L. supera* (Conrad), and *L. miraflorensis* Vaughan. *L. mantelli* is a larger species and has longer lateral chambers; *L. supera* has well-developed pillars and papillae; and *L. miraflorensis* is more dome-shaped in the central part.

LEPIDOCYCLINA (LEPIDOCYCLINA) MANTELLI (Morton) Gümbel

Plate 3, fig. 1

1920. *Lepidocyclina mantelli* CUSHMAN, U. S. Geol. Survey Prof. Pap. 125, p. 57, pls. 12–14 (references to previous literature).
1924. *Isolepidina mantelli* H. DOUVILLÉ, Soc. géol. France, mém., n. s., vol. 1, mém. 2, p. 37, text figs 17 and 17 *a–d*.
1924. *Lepidocyclina* (*Lepidocyclina*) *mantelli* VAUGHAN, Geol. Soc. Amer. Bull., vol. 35, pp. 796, 797, text fig. 1.

There is no need for a redescription of the traditional *Lepidocyclina mantelli*, but there is reason for questioning whether the traditional *L. mantelli* is the true *L. mantelli*, for no expert on the genus has, so far as I know, restudied Morton's type. In *L. mantelli* as usually accepted there are no pillars and the lateral chambers are low and long, as shown on plate 3, figure 1. In these features it differs from the other American forms.

Geologic horizon.—Oligocene, Marianna limestone at many localities in Alabama and Florida, and probably in Mississippi.[1]

LEPIDOCYCLINA (LEPIDOCYCLINA) MANTELLI (Morton) Gümbel, variety

Plate 3, figs. 2*a*, 2*b*, Plate 4, figs. 1–2

This variety differs from the traditional *Lepidocyclina mantelli* by having a finely papillate outer surface and small but well-developed pillars and by somewhat more open lateral chambers, as shown by plate 3, figures 2*a*, 2*b*, plate 4, figure 2.

Locality and geologic horizon.—Perdue Hill, above Claiborne Landing, Alabama River, Ala.; Marianna limestone; bed No. 3 of C. W. Cooke's section. Collected by C. W. Cooke.

Affinities.—This variety lies between the usually accepted *L. mantelli* and *L. supera*. It resembles the former except in the features above indicated and it is somewhat thicker in the umbonal region. It differs from *L. supera* by its greater diameter and by its less pronounced lenticular form. The differences are shown by plate 3, figures 2*a*, 2*b*.

This variety appears to come from the original locality of *Nummulites mantelli* Morton, and it may be the true *L. mantelli*, while the usually accepted *L. mantelli* may be a variety which has no pillars and no papillae on the surface. The type of the species, which is probably in the Museum of the Academy of Natural Sciences of Philadelphia, should be restudied.

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[1] See Cushman, U. S. Geol. Surv. Prof. Pap. 125. p. 125.

LEPIDOCYCLINA (LEPIDOCYCLINA) SUPERA (Conrad) H. Douvillé

Plate 3, fig. 3

1920. *Lepidocyclina supera* CUSHMAN, U. S. Geol. Survey Prof. Pap. 125, p. 59, pl. 26, figs. 5–7 (references to previous literature).
1924. *Isolepidina supera* H. DOUVILLÉ, Soc. Géol. France, mém. n. s., vol. 1, mém. 2, p. 40, pl.1, figs. 9, 10, text-figs. 23–26.
1924. *Lepidocyclina* (*Lepidocyclina*) *supera* VAUGHAN, Geol. Soc. Amer. Bull., vol. 35, pp. 797, 819, pl. 33, fig. 3.

The external features, the embryonic chambers, and the equatorial chambers of *L. supera* have been very well figured but no good illustration of a vertical section has hitherto been published. Therefore, such a section of microspheric specimen is given on plate 3, fig. 3. The test is smaller than that of *L. mantelli* and is more lenticular in form. The lateral chambers are low and are decidedly irregular in shape and size; the walls between successive layers vary greatly in thickness. Pillars are well developed.

Geologic horizon.—Byram marl, uppermost Oligocene, of Mississippi and Alabama; Glendon formation in Alabama and probably in Mississippi.

LEPIDOCYCLINA (LEPIDOCYCLINA) MIRAFLORENSIS Vaughan

Plate 4, figs. 3–5

1919. *Lepidocyclina vaughani* (part) CUSHMAN, U. S. Nat. Mus. Bull. 103, p. 93, pl. 37, figs. 1, 2, 3, and 5 (not pl. 37, fig. 4, nor pl. 38).
1923. *Lopidocyclina miraflorensis* VAUGHAN, Nat. Acad. Sci. Proc., vol. 9, p. 257.
1924. *Lepidocyclina* (*Lepidocyclina*) *miraflorensis* VAUGHAN, Geol. Soc. Amer. Bull., vol. 35, p. 797.

Since no adequate illustration of the equatorial chambers of this species has yet been published, that deficiency is here supplied; and figures of vertical sections are presented for purposes of comparison with the other species discussed in this paper. *Lepidocyclina miraflorensis* and *L. forresti* are closely related, but they are distinguished by important differences. In *L. miraflorensis* the central part of the test is more domed and the equatorial chambers increase more rapidly in height from the center toward the periphery than in *L. forresti*. In *L. forresti* the test is relatively more compressed and the diameter is greater.

Locality and geologic horizon.—The cotypes of *L. miraflorensis* were collected by Dr. D. F. MacDonald on the wagon road one-half mile south of Miraflores Station, Panama Canal Zone, U. S. G. S. locality No. 6255. The horizon is supposed to be the lower Miocene, Emperador limestone, but the stratigraphic position is not definitely known.

EXPLANATION OF PLATES

Plate 1

Lepidocyclina forresti, new species

FIGS. 1–3. Cotypes from east of Lynch Point, Willoughby Bay, Antigua. Figs. 1 and 2, views of the surfaces of specimens, ×1.8. The larger specimen in Fig. 1 is probably a microspheric individual. Fig. 3, embryonic and equatorial chambers, ×18.3.

4. Paratype from Long Island, Antigua. Horizontal section of a microspheric individual, ×18.3; shows pillars in the umbonal region, surface reticulations, and equatorial chambers.

Plate 2

Lepidocyclina forresti, new species

FIGS. 1, 2. Cotypes, macrospheric individuals, from east of Lynch Point, Willoughby Bay, Antigua. Fig. 1, vertical section, ×18.3. Fig. 2, embryonic chambers, ×18.3.

3, 4, 5. Paratypes from Long Island, Antigua. Fig. 3, macrospheric individual, embryonic and equatorial chambers, ×18.3. Fig. 4, microspheric individual, vertical section, ×18.3. Fig. 5, peripheral portion of a specimen, probably microspheric, ×18.3.

6. Embryonic chambers of a specimen from Rifle Butts, Antigua, U. S. G. S. locality No. 6854.

Plate 3

FIG. 1. *Lepidocyclina mantelli* (Morton) Gümbel, as usually accepted; vertical section of part of a microspheric test, ×18.3. U. S. G. S. locality No. 2636, Wayne County, Miss.

2*a*, 2*b*. *Lepidocyclina mantelli* (Morton) Gümbel, var.; two parts of the same vertical section of a microspheric test. Fig. 2*b* joins the lower part of Fig. 2*a*, ×18.3; U. S. G. S. locality No. 6729, Marianna limestone, Perdue Hill, near Claiborne, Ala.; probably topotype of *L. mantelli*.

3. *Lepidocyclina supera* (Conrad) H. Douvillé; vertical section of a microspheric topotype, ×18.3; Byram marl, U. S. G. S. locality No. 3722, Vicksburg, Miss.

Plate 4

FIGS. 1, 2. *Lepidocyclina mantelli* (Morton) Gümbel, var., macrospheric forms. Fig. 1, embryonic and equatorial chambers, ×18.3. Fig. 2, vertical section, ×18.3. U. S. G. S. locality No. 6729, Marianna limestone, Perdue Hill, near Claiborne, Ala.; probably topotypes of *L. mantelli.*

3, 4, 5. *Lepidocyclina miraflorensis* Vaughan, from U. S. G. S. locality No. 6255, half a mile south of Miraflores Station, Panama Canal Zone. Fig. 3, horizontal section, ×18.3, to show equatorial chambers and surface reticulations. Figs. 4, 5, vertical sections, ×18.3.

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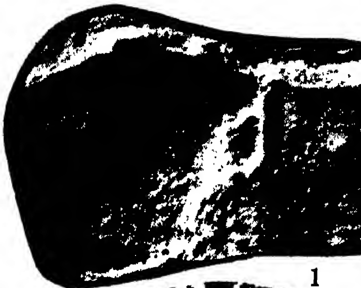

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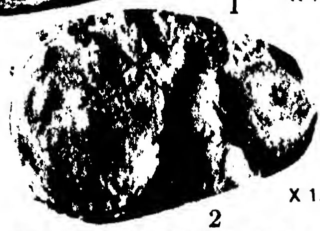

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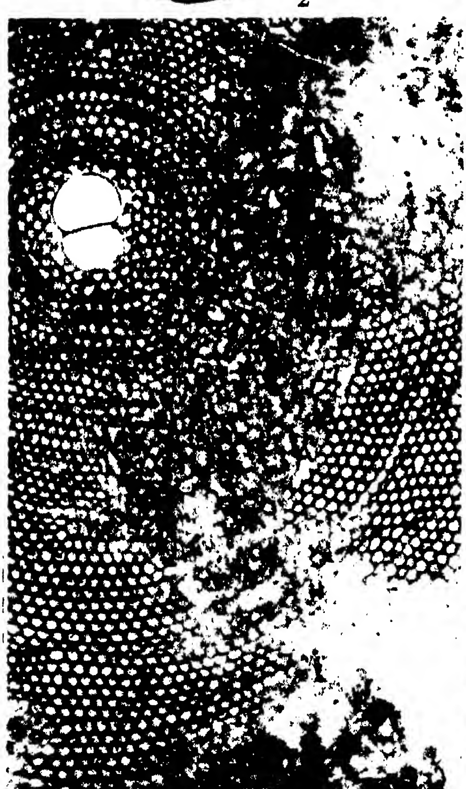
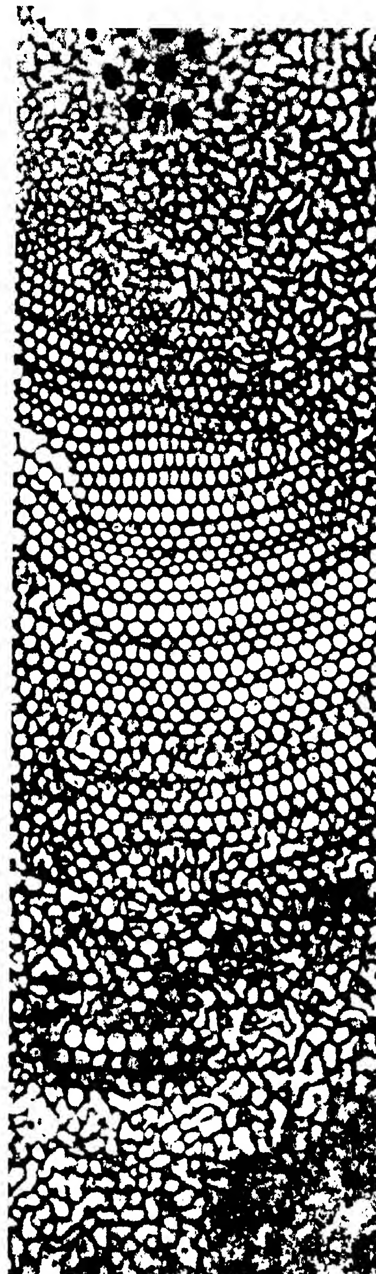


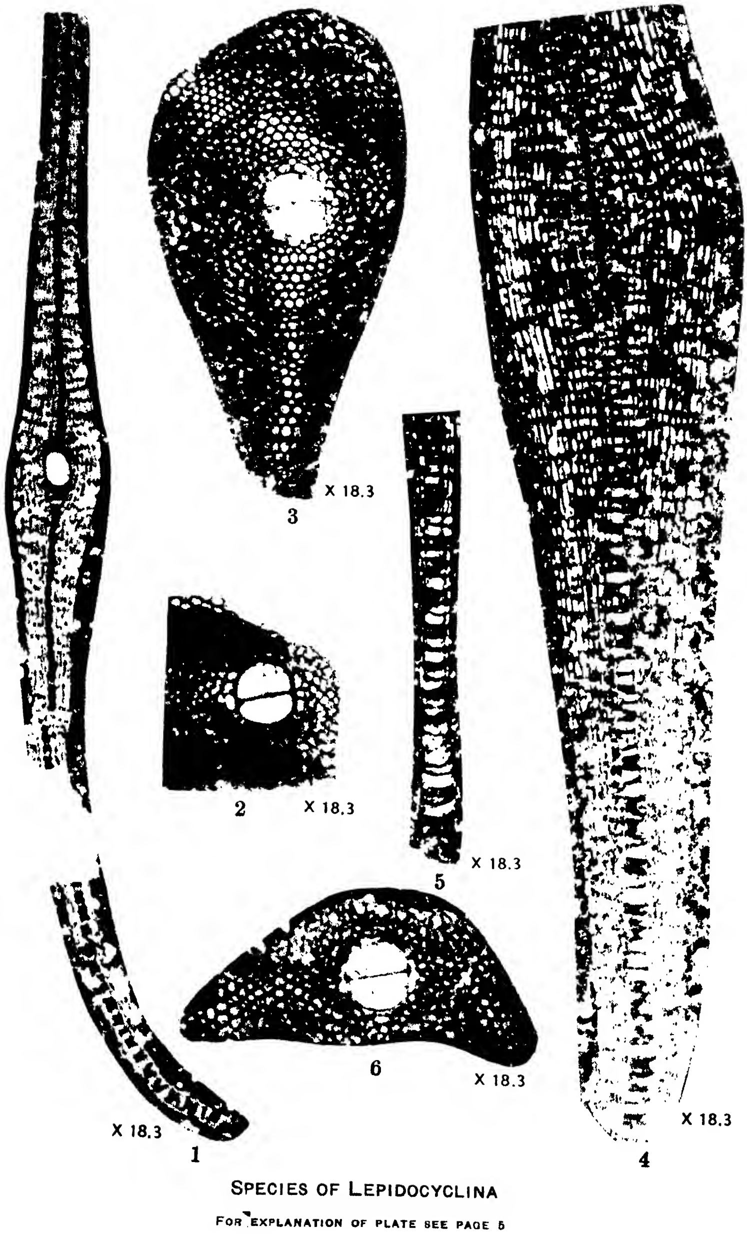
3 X 18.3



4 X 18.3

SPECIES OF LEPIDOCYCLINA

FOR EXPLANATION OF PLATE SEE PAGE 6



SPECIES OF LEPIDOCYCLINA

FOR EXPLANATION OF PLATE SEE PAGE 5

SPECIES OF LEPIDOCYCLINA

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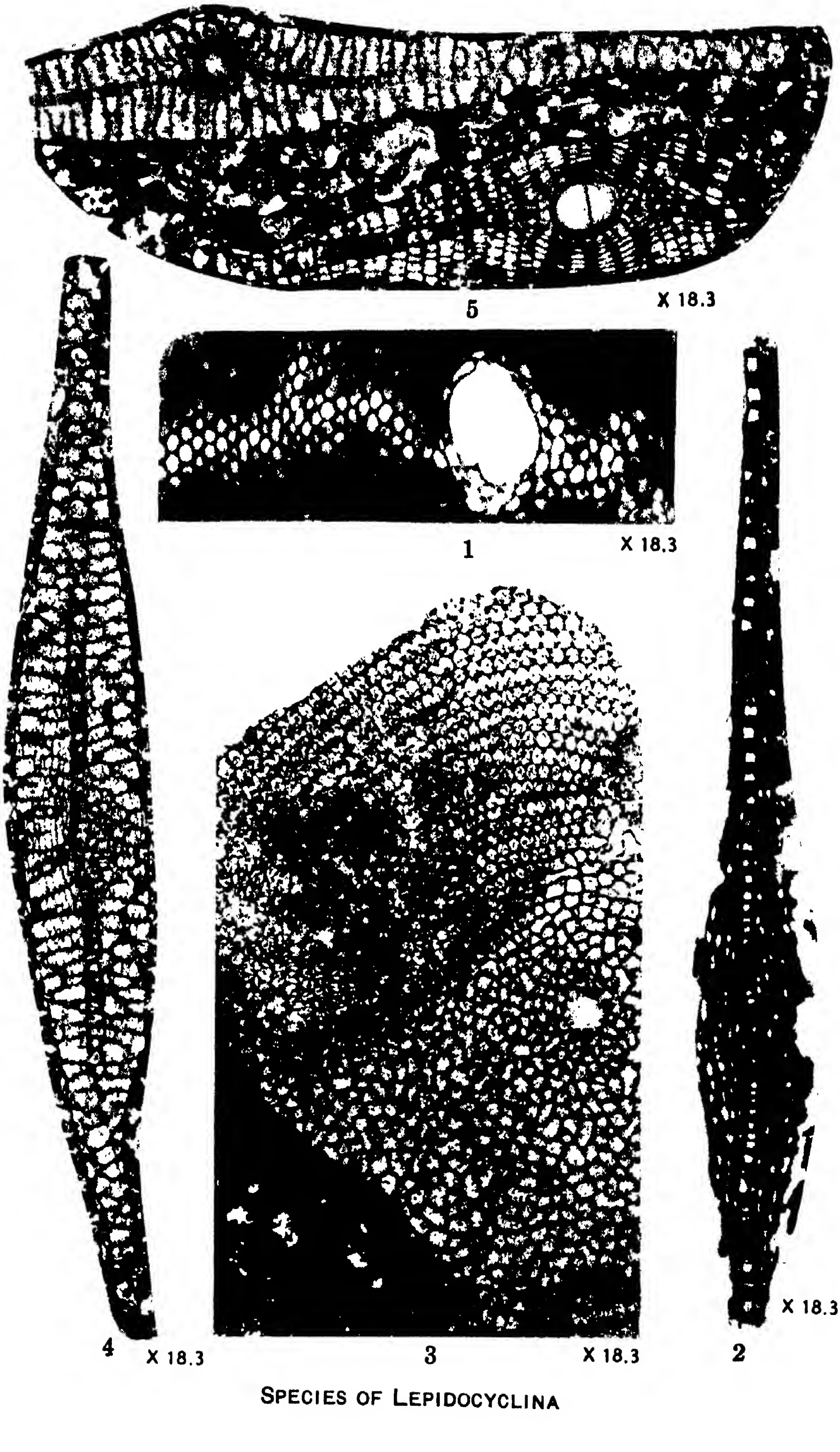

SPECIES OF LEPIDOCYCLINA

THE DIGGER WASPS OF NORTH AMERICA OF THE GENUS PODALONIA (PSAMMOPHILA)

By H. T. Fernald,

Of the Massachusetts Agricultural Experiment Station, Amherst

INTRODUCTION

The studies presented in this paper were begun a number of years ago and have been continued in the intervals between the other duties of the writer. That they were not completed earlier is due, first, to those duties; and second, to the great amount of variation present in the insects concerned. This variation has made necessary the examination, over and over, of thousands of specimens and their study in relation to the climatic conditions of the localities where they were captured, which has required much time.

This paper has been based on the remarkably fine collection of the genus in the United States National Museum, supplemented by loans from more than 50 other museums and private collections. During nearly six months spent in Europe for the purpose, the types there were carefully studied and compared with material taken from this country, and almost every type of the North American species, both in *Podalonia* and in *Sphex* (*Ammophila* Authors), which is still in existence there, was found and examined.

This paper deals with the relatively small genus *Podalonia* Spinola; a second on the much larger genus *Sphex* is well along, and it is the hope of the writer that it will soon be ready for publication.

To all those who loaned specimens for study and who have so patiently waited year after year for their return, the writer desires to express his grateful appreciation; to name them would take an unwarranted amount of space. But he desires to express his thanks in particular to the officers of the United States National Museum; of the American Entomological Society, and of the Museum of Comparative Zoölogy of Harvard University for the opportunities given him to examine the types of species belonging to the group, in those collections; and to S. A. Rohwer, of the United States Bureau of Entomology, for his constant cooperation, his kind suggestions, and the aid received from the free statement of his views on points which have seemed debatable.

GENERAL STRUCTURE

An insect of the genus *Podalonia* is, as a rule at least, under an inch in length. In most cases the body is rather slender and the legs long. The head is quite large, rounded from the front, rather transverse oblong with rounded corners, viewed from above, and quite a portion of it is taken up by the large, compound eyes. Between these the surface is quite flat or even depressed above the antennal articulations, but below these the clypeus in the females may be strongly swollen centrally. The cheeks behind the compound eyes may be quite thick above, contributing largely to the oblong outline, but below this they may narrow quickly or slowly.

The prothorax, for convenience, may be divided, above and from the side, into the neck, the rather slender portion to which, at its front end, the head is joined; and the collar. Behind the neck the segment widens and rises more or less abruptly till about as high as the mesonotum; it then rounds backward, then downward somewhat to articulate with the front margin of the mesonotum. At the sides, the segment also widens somewhat and articulates with the front corners of the mesonotum. It is this elevated region above and its sides, just described, to which the term collar is here applied. At the side, close to the front corner of the mesonotum, is a backward extension of the prothorax nearly circular in outline, slightly swollen so that it somewhat resembles a tegula, and fringed behind with a thick row of short, fine hairs. This projection, here called the prothoracic lobe, lies over a somewhat depressed area of the mesopleuron, concealing a spiracle there.

The other portions of the thorax call for little in the way of description. Posterior and dorsal to the thorax proper, however, and so compactly joined to it as to form a part of the thoracic mass, is the propodeum or first true abdominal segment, which requires consideration. The dorsal portion of this segment appears to articulate with the hind margin of the postscutellum by a transverse suture. About at the point where the plate begins to bend sharply downward to form the sides of the body, its structure changes in appearance, marking out lateral limits to the dorsal portion. These lines run backward just above the spiracle located on the side, sometimes bending inward slightly around the dorsal margin of the spiracle, then bending laterally more or less before curving inward to form a pointed tip to this area. The outline of the dorsal area thus limited is quite like a shield and is here spoken of as the propodeal disk or shield. Its surface varies in different species and to some extent in different individuals of the same species but, in general, shows punctures and ridges. In their simplest condition the ridges tend to be transverse anteriorly, then more oblique, running back and out from

the median line posteriorly, with the area near the tip of the shield liable to show an inclination to transverse ridges again. The punctures may be coarse, medium, or fine. When coarse and close together, which is particularly liable to be the case anteriorly and near the median line, all traces of the ridges may be lost and a confused appearance of the surface results. Where a tendency for the punctures to lie in transverse rows develops, irregular transverse ridges may develop between the rows of punctures. The punctures are liable to become smaller at the side behind the spiracle and near the tip, and here the ridges are generally finer. The posterior end of the propodeum drops off sharply from the tip of the shield to the articulation of the petiole. Between these points is often a small indentation or fovea, varying in size. The surface of the end is punctured and may be more or less ridged, the ridges, when present, being most evident running downward at the sides of the petiole. The sides of the propodeum are directly continuous with the end and resemble it in markings, though there is a greater tendency to the production of ridges on the sides than at the end or on the shield, particularly near the propodeo-mesopleural suture, the ridges running downward and often somewhat forward.

Where the sides of the propodeum are plainly ridged, this condition is likely to continue on to the metapleuron, the ridges running less downward but more nearly along the body. A small, more or less separated portion of this plate, lying at its upper anterior end beneath the hind wing, is often nearly or quite free from punctures and more noticeably ridged than the other portions. The ridges may extend entirely across the plate and continue more or less on the mesopleuron, or may end at the meso-metapleural suture. The mesopleuron is generally quite closely and coarsely punctured, but ridges on it are usually restricted to that portion adjacent to the metapleuron. A somewhat triangular portion beneath the fore wing may show few punctures and be rather distinctly ridged.

The main mass of the abdomen is connected with the propodeum (and thorax) by a slender, cylindrical stalk, the petiole. In this genus the petiole consists of only one segment (two in *Sphex*) and is apparently only the sternum. At its front end a muscle, attached just above its articulation to the propodeum, attaches to the upper side of the petiole a short distance out and acts as a levator muscle. At its posterior end the petiole broadens out below, forming a sort of flat, spatulate area. Over this portion is apparently the notum of the segment. This rises quite rapidly from the axial line of the petiole ("somewhat bell-shaped," Kohl) and is quite wide, its lateral margin hanging down over the ventral plate. In this notum is a spiracle located in front of, or at most, at the middle of the length of the plate.

Behind this comes the remainder of the abdominal mass (the body behind the slender portion of the petiole is, for convenience, called the abdomen in this paper) having the usual characters. The surface is smooth or, at most, only minutely sericeous, except in the male of one species (*argentifrons*), and with a few rather short, scattered erect hairs. Above, these are almost or entirely on the terminal plate. Below, they are most numerous on the terminal plate, but a few may be present on the more anterior sterna. The form of the tip differs according to the sex (see Sex Distinctions). The posterior outline of the last ventral abdominal plate varies somewhat in different species, but this is, unfortunately, also the case in examples of the same species, which prevents use of this feature as a trustworthy distinction for species.

The wings show little difference from those of related groups. The tegula is generally smooth and glistening. The larger wing veins are generally darker than the smaller ones and usually dark brown or piceous. The wing surface varies from hyaline, through various stages of darkening, to fuliginous, which is accompanied by a deep blue or violet reflection. The depth of this darkening is usually greatest toward the tip of the wing beyond the ends of the veins and cells.

The veins and cells themselves vary greatly, particularly the radial and second and third cubital cells. The radial cell may be rather long for its width, or short and broader; the transverse cubital veins may vary somewhat in their distance apart and in the paths they follow, resulting in differently proportioned cubital cells, particularly the third cubital. Modification of vein arrangement, the introduction or omission, partial or entire, of veins often occurs, giving numerous abnormalities such as a petiolated second cubital cell, etc. Though such variations are usually present on both pairs of wings, this is not always the case, as examples with a petiolated second cubital cell on one side and normal conditions on the other, occur. In general, variations in venation are most frequently found in examples which are below normal size for a species, in small species, and in males.

The legs in this genus, as in all Sphecidae, are rather long. The coxae, trochanters, and femora may bear hairs, usually decreasing in number passing outward along these segments, and some face or faces of them may be more or less sericeous. Spines appear on the tibiae and tarsi, not very long on the tibiae but quite stout. On the tarsi they are usually longer, as compared with the length of the segment, than on the tibiae. The cleaning spine at the tip of the hindtibia has the teeth on the outer half of the spine at least, coarser and more separated than in the genus *Sphex*. In the females the spines on the outer side of the fore metatarsus are usually seven in number,

four on the side proper, one on the laterally projecting angle of the segment at its outer end, and two on the end between the one last mentioned and the articulation of the next tarsal segment. In some species, despite variations, these seven spines are long and maintain their diameter nearly to the end, which often appears almost squarely cut off. Between and around the four long spines on the side, other ordinary ones are usually present. Of the four, the first is liable to reduction to about half the length of the others but is often full size. These spines appear to be used as scrapers by the insects in digging holes where their prey and eggs are deposited. Claws are nearly always (always?) light, ferrugineous or even lighter colored in some cases. None of the North American species have toothed claws. The pulvillus is usually large but is greatly reduced or absent in *luctuosa*.

SURFACE CHARACTERS

The surface markings on the various skeletal plates show much of interest. Nearly every plate bears a smaller or greater number of indentations or pits (termed punctures), more or less circular in outline, not as deep as the diameter of the hole at the surface. From the bottom of each pit grows a hair, so that the abundance of clothing of an insect can be determined by the abundance of the punctures, even with specimens in which most of the hairs have been worn off. Where the punctures are circular in outline the hairs stand erect, though their outer half may be curved; where the pit enters obliquely, giving it an oval outline, the hairs come out obliquely. Different sizes of punctures are paralleled by different sizes of hairs growing out from them. Pubescence, in the sense used by the writer, does not occur in this genus as a rule, except on the clypeus and lower part of the frons in the males. Here the punctures are small, close together, oblique, and the hairs coming from them are decumbent, forming a smooth, continuous covering lying close to the plate itself.

A still finer grade of marking is so minute that its details are hardly perceptible without higher powers, but with a pocket lens or low powers of the microscope a sort of "bloom," suggesting that on a ripe plum, is evident. Where this is found, the plate beneath shows very fine markings which some writers have indicated by describing the surface as "shagreened." This appears also to consist of the most minute punctures, out of which come very minute, decumbent hairs which show on the body much better at some angles than at others. In some cases, if not viewed at the proper angle, they can not be seen at all. A surface described as sericeous is one produced by the tiny hairs just mentioned. Brownish or grayish sericeous is often met with on the antennal filament and elsewhere.

MEASUREMENTS

Various comparative measurements of body parts have been used by different describers of species. These are most often the comparative length of the first two segments of the antennal filament, and the length of the petiole as compared with that of the hind coxa and trochanter taken together.

Several thousand such measurements taken with a filar micrometer indicate that while those of the antennal filament segments may, in some cases, be of value, those of the petiole, as compared with the hind coxa and trochanter, can not often be relied upon.

To obtain such measurements accurately, the measuring limit points must be accurately fixed. The petiole is usually measured from the attachment of the levator muscle on it to the point where the dorsal plate begins at its hinder end. With the coxa and trochanter, however, no common points have been established and the irregular ends of these segments, caused by the irregular sockets, make it impossible to obtain really accurate figures. It is rare that coxa and trochanter are in the same plane and the points of beginning and ending of the measuring can not be made identical in many cases. Variation, too, is found here. In one species the petiole varies, in proportion to the coxa plus trochanter, from 0.62 to 0.89, and in specimens from the same State between 0.63 and 0.77. Under the microscope the difficulty of placing the piece to be measured, exactly at right angles to the line of vision, is also met with. Repetitions of measurements of the same specimens have given variations as great as 0.07, in spite of the utmost care to obtain accuracy, and the final conclusion reached is that the only use which can be made of such measurements is where the petiole is shorter than, or at least no longer than the coxa, as compared with those where it is at least as long as the coxa and half of the trochanter taken together.

COLORS AND COLOR VARIATIONS

These may be perhaps most easily described on the unproved assumption that the insects of this genus were originally entirely black, and in a few species (as *luctuosa*) this is still the case. Assuming a tendency to the developing of ferruginous, this will first appear on the second abdominal segment and on the middle of the mandible, and its first evidence is a change to black with a reddish tinge which may perhaps be termed piceous. Increase of the ferruginous influence leads to dark red, then to ferruginous proper. As this tendency increases, more abdominal segments become involved until the entire abdomen is ferruginous and, in some cases, even pale ferruginous. This color may spread forward as well as backward, involving the first abdominal segment, but the petiole appears quite resistant to this tendency, and the thoracic mass and head appear to

be almost always black. The legs, usually black, may yield to the tendency to become ferruginous and then the tarsal segments, tibia and femora assume this color, the last tarsal segment often less so than the others. Approaching the body, the tendency to become ferruginous appears to struggle for ascendency with the tendency to preserve the black, passing out from the thorax. The result is that the coxae and trochanters (except the hind pair) are usually entirely black, and the femora are streaked with black on their proximal halves. The claws in all species are ferruginous of some shade, even in the totally black species.

In the female of *argentifrons*, the abdomen is a deep blackish blue, and glistening.

The usual color of the hairs is black but they seem to respond to the same influences though more slowly. The more ferruginous species may have pale hairs though this is not a fixed rule. Even a tendency to golden yellow on the clypeal hairs is sometimes noticeable. Pubescence is present only in the males (and on the clypeus of *nicholi* female) as far as observed, on the clypeus and frons, and is white or "silvery." The minute hairs which produce a "sericeous" surface are usually brownish on the antennal filament but may be white or silvery, or of other colors elsewhere.

There appears to be a close correlation between the area occupied by the ferruginous and the habitat of the insect. Thus, specimens of *Podalonia violaceipennis* taken near the ocean or large bodies of water have less red and their wings are more fuliginous than those captured inland. In semiarid regions, the area occupied by the red increases; the wings become more nearly hyaline and the veins lighter. In arid regions, much of the abdomen becomes red, the legs tend to piceous in some cases, and the wings may be hyaline. Apparently the influence of humidity on this species closely corresponds to that already described for *Sphex procerus* (Dahlbom).[1]

SEX DISTINCTIONS

There are several ways by which the sex in this genus may be determined. When the sting is protruded there is, of course, no difficulty, but if not, the novice may need to look for other characters.

In the males there are 13 antennal segments; there are no long spines on the outer side of the fore metatarsus; the margin of the clypeus extends much farther below a line joining the bottom of the eyes than in the female; the petiole is longer and the tip of the abdomen is rather flattened laterally.

In the female the antenna has 12 segments; there are long external lateral and terminal spines on the fore metatarsus; the margin of the

[1] Ann. Ent. Soc. Amer., vol. 19, p. 88, 1926.

clypeus does not extend far below a line drawn between the bottoms of the eyes; the petiole is usually shorter than in the male, and the end of the abdomen is conical.

Hairs may differ in color in the sexes. In some cases the head and body hairs in the female are all black while in the males white hairs occur. In this case they first appear near the hind end of the thoracic mass, then spread forward along the sides of the thorax to the pronotum and even onto the vertex and cheeks on the head. Oftentimes the hairs behind may be entirely white; further forward, black or brown with white tips; and black further forward.

Males nearly always have more black on their bodies than the females. The male *Podalonia valida* has the tip of the abdomen black.

GEOGRAPHICAL DISTRIBUTION

Species of this genus occur in Europe, Asia, Africa, Australia ? (*suspiciosa* Smith), South America (*bocandei* Spinola), and North America. In the last-named country I have examined specimens from as far north as Nova Scotia and Fort McLeod, British Columbia (about latitude 55°), and several species occur in different parts of Canada. Southward they are found in all parts of the United States, in Mexico and to Panama though the records of these southern forms (Biologia Centrali-Americana) suggest that in Central America they are mainly inhabitants of elevated districts.

In North America some species are widely distributed; others rather local. Details of distribution are given in connection with the individual species. Maps illustrating the known distribution of four of the more widely distributed species are included as text figures. In these maps the solid black dots stand for actual locality data, while the cross (×) indicates specimens for which only the state was given.

CLASSIFICATION

One not familiar with the insects of this group will find keys by which they may be traced to the Sphecidae in Comstock's Introduction to Entomology, First Complete Edition, 1924, and on page 963 of that book is a further key leading to the subfamily (there erroneously called tribe) Sphecinae. On page 966 is a brief treatment of the subfamily, but without further classification.

In a previous paper[2] on another section of this subfamily, the group was considered by me as a family and its divisions were called subfamilies. In my opinion this is a better valuation than that given by Comstock, but to produce continuity in the keys and avoid confusion, the key below accepts Comstock's terms and divides the sub-

[2] Proc. U. S. Nat. Mus., vol. 31, p. 295, 1906.

family into tribes. To harmonize this paper with the other,[2] it is only necessary to change the title of the key on page 308 of that paper[2] to read: Analytical key to tribes. This key slightly modified, is given below.

ANALYTICAL KEY TO TRIBES

1. Second cubital cell receiving only the first recurrent vein; the second recurrent vein received by the third cubital cell. (Both recurrent veins are received by the first cubital cell in a few extra-limital forms) 2
   Second cubital cell receiving both recurrent veins, or the second recurrent vein is interstitial with the second transverse cubital. Sometimes the first recurrent is interstitial with the first transverse cubital, or received by the first cubital cell 3
2. Antennae inserted on the middle of the face; claws with one to six teeth beneath; tibiae spinous; tarsal comb present in female (except in *Isodontia*). Chlorionini (*Sphecinae* of Authors)
   Antennae inserted far below the middle of the face; claws simple, either without teeth or with only one small tooth near the middle; tibiae not spinous: tarsal comb in female, absent .... Podiini
3. Claws simple, without teeth (teeth present in some extralimital forms); tibiae more or less spinous; tarsal comb present in female; abdomen more or less elongate; petiole of one, or two segments; cubital vein of hind wing usually originating beyond the transverse median vein. Sphecini (*Ammophilinae* of Authors)
   Claws with a single tooth beneath, sometimes very minute; rarely without a tooth; tarsal comb in female absent; petiole of one segment; cubital vein of hind wing interstitial with transverse median vein or nearly so 4
4. Antennae inserted on middle of face; metathorax with a large U-shaped area above; mesopleura not longer than the height of the thorax ... Sceliphronini
   Antennae inserted far below the middle of the face, on, or just above an imaginary line drawn between bases of the eyes; metathorax without a large U-shaped area above; mesopleura much longer than the height of the thorax. Podiini

In the tribe Sphecini seven genera besides *Sphex* have at one time and another been proposed, namely: *Ammophila* Kirby, 1789; *Miscus* Jurine, 1807; *Psammophila* Dahlbom, 1842; *Coloptera* Lepeletier, 1845; *Podalonia* Spinola, 1853; *Parapsammophila* Taschenberg, 1869; *Eremochares* Gribodo, 1882; and *Ceratosphex* Rohwer (as a subgenus), 1921. *Ammophila*, as has already been shown,[3] can not hold, being a synonym of *Sphex*[4] as the genotype of both genera is *sabulosa* Linnaeus. *Miscus* appears to have been established solely on the basis of the presence of a petiolated third cubital cell. Jurine says: "Lorsque je remarqui pour la première fois la figure de la troisième cellule cubitale des ailes de ces insectes, je présumai que c'etait une anomalie dépendante de la petitesse de ces *Sphex* dont je ne devais par tenir compte, mais l'ayant vue dans quatre individus, dont deux sont indigènes, j'ai cru devoir placer ces hyménoptères dans un genre nouveau."

[2] Proc. U. S. Nat. Mus., vol. 31, p. 295, 1906.
[3] Proc. U. S. Nat. Mus., vol. 31, p. 292-295, 1906.
[4] Opinion 32 rendered by the International Commission on Zoological Nomenclature, Smithsonian Publication 2013, 1911.

Variation of this nature in Sphecids is common, and examples are sometimes met with in which there is a petiolated cell on one side while the other is perfect. An examination of about 1,100 specimens of one species of *Sphex* shows that venation variations are liable to occur either on one or both sides in about one specimen of each hundred, the variation occurring most frequently in the males. *Miscus arvensis* Dahlbom is such a specimen.

Psammophila was established by Dahlbom for insects of this tribe in which the petiole consists of only one segment. This name being preoccupied, *Podalonia* takes its place. This will be discussed at greater length later in this paper. *Coloptera*, proposed by Lepeletier was based as follows: "*Caracteres.* Ceux des deux genres précédens" (*Ammophila* and *Miscus*) "sauf ce qui suit: Deux cellules cubitales seulement." A careful study of the American species of *Coloptera* reveals no characters separating this insect from *Sphex*, and the unreliability of venation alone, used for this purpose has just been indicated and will be further demonstrated in the course of this paper.

Parapsammophila, created by Taschenberg, appears to be based largely upon the presence of two teeth on each claw. As no Sphecini with toothed claws have thus far been observed in North America, the validity of this genus need not be considered further here. *Eremochares*, established by Gribodo, has as its chief reason for existence, the presence of a single tooth on each claw. *Ceratosphex* has its petiole of two segments and the claws are armed with two teeth. As no species with these characters have been found in North America, this leaves *Sphex* (*Ammophila* Authors) and *Podalonia* as the two genera to be considered in this country.

Whether these are sufficiently distinct to entitle them to be regarded as different is an open question. Kohl[5] regards them along with *Eremochares*, *Parapsammophila*, *Coloptera*, etc., as "species groups." They may be considered either as subgenera or genera according to the ideal standards in the minds of different students of the group. Species which might be termed typical in each group are easily recognized and support the valuation of the groups as genera, but in other cases it becomes somewhat difficult to draw the line between them. My personal opinion is that, when a world study of these insects has been made, these groups will be regarded as of at most only subgeneric value. For the purpose of this paper, however, it is most convenient to treat them as genera and deal with *Podalonia* at this time, leaving *Sphex* for separate consideration.

ANALYTICAL KEY TO GENERA

1. Petiole consisting of one segment, its dorsal plate quite broad and more or less bell-shaped; comb teeth on hind tibial spine not crowded, rather stout;

[5] Annalen des k. k. Naturhistorischen Hofmuseums, Wien, vol. 31, p. 228, 1906.

spiracle on first abdominal notum in front of, or at least not behind, the middle of the plate .... **Podalonia**

Petiole consisting of two segments; comb teeth on hind tibial spine closely packed together, rather slender; spiracle on first abdominal (second petiole segment) notum at or behind the middle .... **Sphex**

Genus PODALONIA Spinola

The solitary wasps here placed in the genus *Podalonia* were first separated as a genus by Dahlbom in 1842 under the name *Psammophila*, and included two species, *Psammophila affinis* Kirby and *Psammophila viatica* Linnaeus. Apparently no genotype has ever been designated.

The Linnaean *viatica* was removed from the Sphecidae by Fabricius and placed in the Pompilidae (Psammocharidae) and, though there is still the *Ammophila viatica* of De Geer, which is a *Psammophila* this species is a synonym of *Sphex hirsuta* Scopoli, De Geer's *viatica* not being the same species as the Linnaean one. Accordingly, *Psammophila affinis* Kirby is the genotype of the genus *Psammophila*.

But *Psammophila* of Dahlbom is itself a preoccupied name, having been previously used in 1827 in connection with a genus of Mollusks, and another generic name becomes necessary to replace it. This is found in Spinola's genus *Podalonia* 1853, a genus unintentionally established under most peculiar circumstances. In the course of a discussion upon the making of new genera, based upon what he considered absurdly minor characters, at most of only specific value, Spinola remarks that the genus "*Mischus*" (*Miscus*) was established by Jurine for a European *Ammophila* (*campestris*) "qui a *la troiséme cellule cubitale de l'aile superieure petiolée.* Or au même titre il faudrait isoler pareillement un nouveau genre pour celles qui auraient *la seconde cellule cubitale petiolée*, comme le mâle inedit que M. Bocandè a rapport de la Guinée et dont la description arrive ici à propos quoique l'espece ne vien pas du Para." Then follows the description of *Ammophila bocandei* including the following statements: * * * "petiolo ut in *Ammoph. arenaria* Latr. * * * Alae * * * superiores, cellulis quatuor cubitalibus, prima tertia et quarta, formae consuete, secunda minore triangulare oblique petiolata * * * ." "Il m'en aurait peu couté de construire un nom de genre bien Graecoide et bien significatif, *Podalonia* par exemple, mais j'ai pense qu'il valait mille fois mieux de relever ces particularities alaires dans les diagnoses des *Amm. campestris* et *Bocandei* et de les y laisser pour ce qu'elles sont, pour des characters purement specifiques."

Had it been possible to retain the name *Psammophila* for the wasps concerned, this name of Spinola's might have always remained as, at most, only a synonym. But with *Psammophila* no longer available, the availability of *Podalonia* must be considered. Analyzing the situation, we find that a specific description (*bocandei*) is given in

connection with this name; that in this description reference is made to another species known to be a *Psammophila;* that the structure of the petiole is that of *Psammophila;* and that the only reason for another generic name is the petiolated second cubital cell. Thus a name proposed only as an illustration of the ease with which a significant generic name could be formed becomes actually available as a substitute for *Psammophila.* Its standing is that of a monobasic genus, its generic characters to be found among the specific characters given for its genotype, *bocandei,* and its relation to one other species indicated.

It seems one of the ironies of fate that a name suggested under such circumstances as these and most emphatically rejected by its author, being used only as an illustration, should obtain an accepted standing. Yet no other name, except the unavailable *Psammophila* has been given to these insects. Thus it seems necessary to violate the evident desire of Spinola and establish *Podalonia* as a genus in full standing. The whole situation, as regards Spinola, at once brings to mind the case of *Ignotus aenigmaticus* Slosson (Coleoptera).

GENERIC CHARACTERS

Podalonia, as here considered, may be distinguished most readily from *Sphex,* in most cases, by the petiole. In *Sphex* this slender portion involves two segments, the second being larger, though shorter, than the first, and increasing only slightly backward in size. In *Podalonia* we find only one segment in the petiole, the dorsal plate of this segment (here counted as the first abdominal dorsal plate) being quite large and increasing rapidly in size backward. There are some species, however, in which this plate is rather intermediate between the two conditions and these specimens are liable to be perplexing, and in such cases other characters need consideration. In *Podalonia* the comb teeth on the longer hind tibial spine are not crowded as closely together as in *Sphex* and are coarser, and the spiracle on the first abdominal dorsal plate is in front of, or at least not behind, the middle of the length of the plate.

If these characters were absolutely fixed, no difficulty in separating *Podalonia* and *Sphex* would be encountered, but in a few cases the spiracle is found slightly behind the middle of the plate in *Podalonia* and there are degrees of crowding and in the coarseness of the comb teeth which, in individual specimens, may make the determination of the genus difficult in those cases, and final placing of the insect must be made according to the evidence from all three characters.

Where pubescence is present in the female (except in *P. nicholi*) the insect may safely be considered a *Sphex.* In the male, pubescence on the clypeus is useless as a distinction, but it does not seem to occur elsewhere on the body (exceptions?). A series of parallel rugosities on the side of the pronotum in front of the prothoracic lobe, running

upward and slightly forward, is so nearly universal in *Podalonia* that it can nearly always be used safely in determining the genus, in connection with the other characters.

These statements indicate why it is difficult to decide whether *Sphex* and *Podalonia* should be regarded as distinct genera, only or subgenera.

ANALYTICAL KEY TO SPECIES

1. Females (see p. 7) 2
   Males 8
2. Anterior margin of clypeus with teeth 3
   Anterior margin of clypeus without teeth 6
3. Anterior margin of clypeus with four teeth. Large species 4
   Anterior margin of clypeus with two teeth 5
4. Inner face of fore coxa with a tooth near its end: wings usually semi-hyaline .... **valida** (Cresson) (p. 13)
   Inner face of fore coxa without a tooth; wings strongly fuliginous. **quadridentata** (Cameron) (p. 17)
5. Clypeus silvery white pubescent .... **nicholi** (Carter) (p. 17)
   Clypeus without pubescence .... **sonorensis** (Cameron) (p. 20)
6. Body entirely black (sometimes slightly piceous) .... **luctuosa** (Smith) (p. 21)
   Head and thorax black; abdomen deep blue .... **argentifrons** (Cresson) (p. 26)
   Head and thorax black; abdomen more or less ferruginous 7
7. Petiole noticeably longer than hind coxa but shorter than hind coxa and trochanter together .... **violaceipennis** (Lepeletier) (p. 30)
   Petiole little if any longer than hind coxa; often seemingly shorter **violaceipennis**, var. **compacta**, new variety (p. 33)
8. Abdomen partly ferruginous 9
   Abdomen black, sometimes tinged with piceous 12
9. Legs black 10
   Legs partly ferruginous .... **nicholi** (Carter) (p. 17)
10. Inner face of fore coxa with a tooth near its end .... **valida** (Cresson) (p. 13)
    Inner face of fore coxa without a tooth near its end 11
11. Body rather stout for its length. **violaceipennis**, var. **compacta**, new variety (p. 33)
    Body slender .... **violaceipennis** (Lepeletier) (p. 30)
12. Second and third dorsal abdominal plates covered with minute, silvery, decumbent hairs (sericeous) looking like a white, transverse streak. **argentifrons** (Cresson) (p. 26)
    Without silvery, decumbent hairs on abdomen .... **luctuosa** (Smith) (p. 21)

DESCRIPTIONS OF SPECIES

PODALONIA VALIDA (Cresson)

Ammophila valida CRESSON, Proc. Ent. Soc. Phila., vol. 4, p. 461, 1865. Female.

Ammophila grossa CRESSON, Trans. Am. Ent. Soc., vol. 4, p. 209, 1872. Female.

Ammophila montana CAMERON, Biol. Centr.-Amer., Hym., vol. 2, p. 20, 1888. Male.

?*Ammophila jason* CAMERON, Biol. Centr.-Amer., Hym., vol. 2, p. 20, 1888. Female.

Psammophila grossa (Cresson) MELANDER and BRUES, Biol. Bull., vol. 3, p. 41, 1902. Male.

Ammophila (*Psammophila*) *valida* (Cresson) MELANDER, Psyche, vol. 10, pp. 158, 162, 1903.

Ammophila (Psammophila) grossa (Cresson) MELANDER, Psyche, vol. 10, p. 158 (female): p. 159 (male) 1903.

Psammophila grossa (Cresson) H. S. SMITH, *Univ. Neb. Studies, vol. 8,* p. *331, 1908.*

Psammophila valida (Cresson) MICKEL, Univ. Neb. Studies, vol. 17, p. 406, 1917.

Psammophila grossa (Cresson) MICKEL, Univ. Neb. Studies, vol. 17, p. 406, 1917.

Psammophila valida (Cresson) CARTER, Ent. News, vol. 34, p. 365, 1924. Male.

Psammophila grossa (Cresson) CARTER, Can. Ent., vol. 57, p. 132, 1925. Female and male.

Psammophila valida (Cresson) CARTER, Can. Ent., vol. 57, p. 132, 1925. Female and male.

Head, thorax, petiole (usually), and legs, black; abdomen partly to entirely ferruginous: fore coxa with a small tooth on its inner face near its trochantal articulation. A large species.

Female.—Head: Broad; clypeus strongly swollen centrally; its surface covered with coarse punctures, though smaller and fewer near the middle; its anterior margin rounded and bearing four broad teeth on the middle third, the outer larger and reflexed; vertex rather flat behind ocelli; frons and vertex rather closely punctured except near ocelli; antennae black, the filament more or less brownish sericeous; mandibles tinged with ferruginous over the middle third and sometimes the tip also.

Thorax: Prothorax rather closely punctured like frons, its sides in front of prothoracic lobe obliquely rugose; collar with a slight, median, indented groove toward the mesonotum; mesonotum quite uniformly punctured and with a faint median longitudinal ridge between two indented lines extending about half way back; scutellum with scattered, fine punctures medially; finely, longitudinal rugose elsewhere; postscutellum raised centrally, its sides faintly rugose; propodeal disk coarsely, irregularly rugose, averaging transverse in direction, with a median ridge on front half; more or less punctured between the rugosities; end of propodeum rugose with punctures between; sides rugose and punctured, the rugosities running downward and forward; metapleuron rugose and punctured, the rugosities near the mid-coxa running nearly horizontal; mesopleuron more sparsely rugose, with coarse punctures between the ridges.

Abdomen: Petiole usually black, sometimes partly ferruginous or tinged with ferruginous; straight, longer than hind coxa, its terminal enlargement below the first abdominal dorsal plate more or less ferruginous; first dorsal plate often shaded with black; remaining abdominal plates above and below usually ferruginous, but in specimens from Texas, California (and elsewhere?) the last two segments and sometimes a part of the next one forward may be black and the rest is sometimes darkly clouded.

Wings: Varying from hyaline to somewhat fuliginous; costal vein dark, the others rather light; tegulae black in front, more or less tinged with ferruginous at the lateral and hinder margins.

Legs. Black, sometimes tinged with ferruginous; fore coxa, near its end on its inner face, with a small tubercle or tooth, often hard to see. On the under surface of trochanter and femur is a row of long hairs and the coxal tooth is nearly (though a little in front of) in the line of this row. Spines of tibia and tarsus, except fore tibia, varying from light to black; claws dark ferruginous; pulvilli well developed.

Male.—Similar to female, except as follows:

Head: Clypeus elongate, silvery pubescent, its anterior margin transverse with rounded corners; frons silvery pubescent.

Thorax: Hairs mixed black and cinerous, some black at base and whitish toward tip; mesopleuron less liable to bear rugosities than in female.

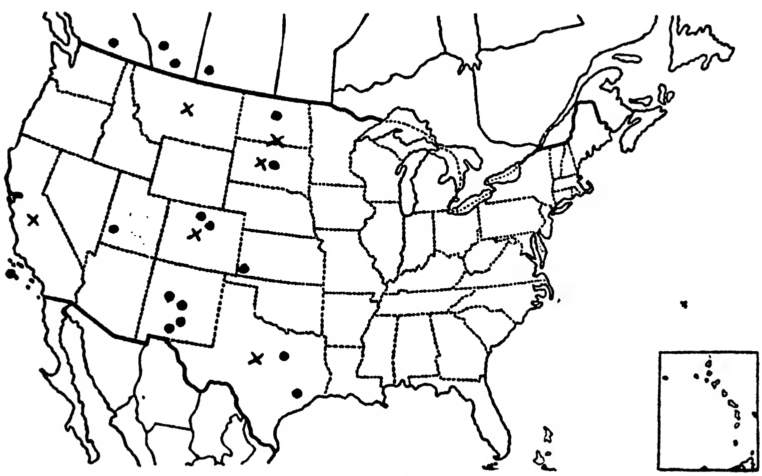

FIG. 1.—MAP ILLUSTRATING THE KNOWN DISTRIBUTION OF PODALONIA VALIDA (CRESSON)

Abdomen: Terminal segments black in all specimens seen; last ventral plate rather transverse behind, with a broad central emargination though somewhat variable in this regard.

Legs: Cinereous sericeous (coxae often almost pubescent); spines black.

Length.—Females, 18–24 mm; males, 18–22 mm; 44 females and 32 males examined.

Distribution.—Texas (Bosque, Travis, and Bastrop Counties; Austin, May, 1900); New Mexico (Highrolls, June, 3–12, 1902; Albuquerque; Organ Mountains, August 29; White Mountains, above 6,700 feet, July, 27; Bulah, May 30); Kansas (Morton County, 3,200 feet); Nebraska ("Entire State. Flies from June to September," Smith); Colorado (Denver, September 7, 1901; July 12, 1902; Boulder, September 3; Fort Collins, July 28, 1900); Utah (Beaver Canyon); South Dakota (Pierre); North Dakota (Minot, August 22, 1915, on *Kuh-*

nistera oligophylla—O. A. Stevens); Montana; Alberta (Medicine Hat, August 20, 1916; July 17, 1917; Lethbridge, August 18, 1922; August 6, 1923; September 15, 1924; Brooks, July 27, 1923; August 12, 1924); British Columbia (Okanogan, July 19, 1915); "N. W. T."; California (Santa Rosa Island and unnamed places); Mexico.

This insect appears to be most common in arid areas, though extending out of them in Texas and California where the female may have the last abdominal segments black.

One case of abnormal venation has been observed in the specimens studied. This consisted of an incomplete second transverse cubital vein in the fore wing of one side.

Types.—*P. valida* (Cresson) was described from two female specimens, one of which, now marked Type No. 1929, is in the collection of the American Entomological Society. The type of *grossa* Cresson, also a female, collected by Heiligbrodt, was supposed to be in the United States National Museum, but the specimen there, marked Type 1682, bears the label "Texas. Belfrage." It agrees with the description, however, and the label last mentioned probably does not belong on this specimen. The type of *montana* (Cameron) is not in the British Museum labelled type, but there is a male specimen there bearing this name in Cameron's writing, with the genitalia removed, and as the genitalia of *montana* were figured by Cameron and the locality, etc., agree, I think there is no doubt this specimen is really the type. There are two specimens of *jason* in the British Museum, one labelled in Cameron's hand and also with a type label. This species will probably prove to be a synonym of *valida*, different slightly because of its much more southern habitat, but it seems wise to place it here with a slight doubt. The male *grossa* of Melander and Brues was described from two specimens taken in Texas, one of which is now in the collection of Prof. A. L. Melander; the location of the other I do not know.

P. valida male, described by Carter, is now in the collection of the Canadian National Museum. I have seen all of these types with the exception of those described by Melander and Brues.

There has been some confusion about this species, caused by the idea of early workers that color distribution could be depended on for specific distinction. The first *valida* had its abdomen entirely ferruginous. In *grossa* the tip was black and as both were females they were consideredd ifferent species. The males of *grossa* described by Melander and Brues have black on the abdomen, corresponding with Cresson's female *grossa*. Carter's *valida* male is the same and he was perhaps not aware of Melander and Brues' work or thought that, finding no females in Alberta with black on the abdomen, this male could not be *grossa* but must be the male of *valida*—in which he was of course correct.

PODALONIA QUADRIDENTATA (Cameron)

Ammophila quadridentata CAMERON, Biol. Centr.-Amer., Hym., vol. 2, p. 23, 1888. Female.

Ammophila quadridentata (Cameron) FOX, Proc. Cal. Acad. Sci., ser. 2, vol. 4, p. 102, 1894,

Ammophila (Psammophila) quadridentata (Cameron) MELANDER, Psyche, vol. 10, pp. 158, 162, 1903. Female.

Very similar to *valida* but with strongly fuliginous wings; a very darkly ferruginous abdomen without black at tip and with no tubercle or tooth on the fore coxa. In one or two cases I have thought that the surface near where this tooth should be was somewhat swollen, but with no actual tooth, long or short, present.

No male which would belong to this species has as yet been found or, at least, recognized.

Length.—22–24 mm.

Distribution.—The type came from Ventenas, Mexico, 2,000 feet. I have seen two other specimens, one from "Mexico," the other from San Marcos, Nicaragua (Coll. Baker). Fox's specimen was from "west side of El Taste," Lower California, which would be not so very different in climatic conditions, perhaps, if the altitude be taken into consideration, but it may have been a dark specimen of *valida* instead, the presence and significance of the coxal tooth not having been known at that time.

Type.—Cameron's type, so labeled in his writing and also bearing a printed type label, is in the British Museum.

For a long time I considered this insect as nothing more than a subspecies or even a variety of *valida*, but the absence of the coxal tooth leads me to hold it for the present as a separate species, often approximated to by suffused specimens of the other, which, however, have the tooth.

PODALONIA NICHOLI (Carter)

?*Ammophila morrisoni* CAMERON, Biol. Centr.-Amer., Hym., vol. 2, p. 21, 1888. Male.

Psammophila nicholi CARTER, Ent. News, vol. 35, p. 366, 1924. Female.

Head, thorax, petiole and parts of legs black; remainder generally bright red rather than ferruginous; hairs mostly white. A very distinct species.

Female.—Head: Broad; clypeus swollen except marginally, its anterior margin rounded, truncate on central half, with a small tooth at outer end of truncation where the margin begins to curve backward to the base of the mandible; clypeal surface and lower part of frons, particularly at the sides, silvery pubescent and with long hairs which may be almost golden; entire surface of head punctured, though not closely nor very coarsely; antennae black or piceous

near base; black, grayish sericeous outwardly; mandibles varying from entirely black to black with a median ferruginous tinge.

Thorax: Prothorax rather smooth, its sides almost without oblique rugosities in front of the prothoracic lobe; mesonotum minutely, not closely punctured, scutellum with sparse, minute punctures and faint longitudinal rugosities; postscutellum finely, transversely rugose; propodeal disk finely, evenly rugose, the rugosities in front running strongly backward and outward, but on the posterior half, more directly outward; hardly meeting on the middle line they leave a distinct line there, though usually with no ridge; no punctures evident on the disk; end of propodeum with a fovea and a depressed line from tip of disk to the petiolar articulation; at each side of this are oblique rugosities and punctures; sometimes there is a silvery pubescent spot on each side at base of petiole; sides of propodeum irregularly rugose and punctured; metapleuron with rather coarse, oblique punctures and sometimes traces of rugosity; mesopleuron similar.

Abdomen: Petiole almost as long as hind coxa and trochanter together; abdominal segments dark, glistening ferruginous but often tinged darker, appearing to be shaded with black.

Wings: Hyaline, often with a yellowish shade; veins brown; stigma almost yellow.

Legs: Coxae black; the fore coxa with a tooth on its inner face close to the trochantal articulation; trochanters black or more or less ferruginous; femora, tibiae and tarsi ferruginous, often pale; leg hairs and spines pale ferruginous; claws ferruginous; pulvilli well developed.

Male.—Here described for the first time.

Head, thorax, petiole, and parts of the abdomen and legs black; remainder ferruginous; head and thorax quite thickly clothed with long, quite erect, slender, white hairs; wings hyaline with dark veins.

Head: Clypeus extended some distance below the eyes and reflexed forward below a line joining the nearest points of the eyes; central half of its lower margin transverse, slightly, broadly emarginate; its side margins nearly at right angles to the central part; surface densely covered with silvery pubescence; sides of frons similarly pubescent well up toward level of anterior ocellus; a median depressed line from between antennae to anterior ocellus; antennae black or piceous near base, sericeous outwardly; mandibles black or piceous.

Thorax: Pro- and mesonotum rather sparsely punctured, the sides of the former very weakly rugose in front of the prothoracic lobe; thoracic and propodeal markings as in the female; pubescence at base of petiole often absent.

Abdomen: Petiole black, its basal half somewhat punctured and bearing white hairs; about as long as hind coxa and trochanter together; first abdominal segment more or less black above and

below; last two or three segments black above and below, the extent of the black varying somewhat; last ventral segment rounded acuminate behind, with a broad central notch.

Wings: Hyaline; veins dark brown; tegulae piceous, tinged more or less with ferruginous outwardly.

Legs: Coxae and trochanters black, more or less sericeous; fore coxa with a tooth, as in female; inner portions of femora black, outer portions ferruginous, the proportions varying; tibiae ferruginous, occasionally blackish at the outer end or with a black streak; tarsi piceous, more or less sericeous, the spines and claws light.

There are slight variations in the outline of the clypeal margin and in the amount of ferruginous on the abdomen and legs in specimens of this sex which I have examined.

Length.—Females, 16–18 mm; males, 14–17 mm.

Distribution.—The holotype of this species was taken at Tucson, Ariz., April 5, 1924. I have seen eleven other females, all from Southern California (place not given), ten of these in the collection of the American Entomological Society and one in my own collection. The twelve males seen, also came from Southern California, eleven being in the same lot as the females and one in my own collection. This species should be found in Northwestern Mexico and perhaps New Mexico also, at least.

Types.—The holotype female, which I have studied, is in the Division of Entomology collection of the University of Minnesota, St. Paul. The allotype male (here described) is in the collection of the American Entomological Society at Philadelphia. Two other males used in preparing the description and which may, therefore, be described as paratypes of the allotype, or parallotypes, are also in the collection of the American Entomological Society.

Cameron's species *morrisoni* was described from a male takon in Northern Sonora, Mexieo. The only specimen in the British Museum, which I could find, labelled "*Ammophila morrisoni* Cam. Type" in Cameron's writing, is not a male but a female and does not agree at all well with his description. It would seem probable that the label may have been in some way attached to the wrong specimen, which in 1913 was found with the group of specimens placed under *sonorensis*, possibly in the belief of whoever placed it there, that the two species are the same.

The type of *morrisoni* being therefore not available for study, Cameron's description only, remains for comparison with *nicholi*. It does not agree in all points with the males of *nicholi*, but is still so similar as to make it not unlikely that the two are the same species. The locality of Cameron's species is not far from where *nicholi* has been taken.

This beautiful species, easily distinguished by its bright ferruginous legs, appears to be rare, the lot in Philadelphia having evidently been taken at one time at some place in "So. Cal.," and the only other specimen being the holotype from Tucson. It should be carefully searched for by collectors in those and neighboring regions.

PODALONIA SONORENSIS (Cameron)

Ammophila sonorensis CAMERON Biol. Centr.-Amer., Hym., vol. 2, p. 21, 1888. Female and male.

Ammophila (Psammophila) sonorensis (Cameron) MELANDER, Psyche, vol. 10, pp. 158, 162, 1903. Female.

Black, except second and parts of first and third dorsal abdominal plates, and more or less of the corresponding ventral ones. Hairs long, black, sometimes with a bluish tinge. Wings quite uniformly fuliginous, the hinder pair less so to beyond the veins, and with a violet reflection. A small species.

Female.—Head: Clypeus broad, only a little more than half as high as wide; its middle swollen; its anterior margin flat and somewhat reflexed laterally and extending downward a short distance, then curving to run transversely to a small tooth, then rather transverse or broadly, weakly emarginate at the middle, this central third between the teeth much less reflexed than the lateral third; surface quite closely and coarsely punctured, bearing long hairs; frons similarly punctured; median impressed line from antennae to anterior ocellus faint; antennae; scape and pedicel shining, black; filament somewhat sericeous, giving a dull olive tinge to these segments; first filament segment not quite twice as long as the second; mandible shining black, with a shade of dark ferruginous near the middle.

Thorax: Collar of pronotum with no perceptible median longitudinal groove above; sides obliquely rugose in front of prothoracic lobe, which is nearly smooth and shining; pronotal surface rather sparsely punctured; mesonotum punctured, perhaps rather more coarsely and closely than pronotum, its anterior half with a median impressed line, double, with a slight ridge between, in front; scutellum rather flat, with a few punctures in front and slightly rugose behind; post-scutellum shining centrally, its sides closely punctured; propodeal disk closely punctured, with more or less of irregular transverse rugosities, most definite and clearest at sides behind the spiracle and at the tip; end of propodeum with a distinct impressed line from tip of disk to petiolar articulation; its surface closely, coarsely punctured; its sides similar except for slight ridges between the punctures; metapleuron similar, except that the ridges may be more evident and tend to run more forward as well as downward; mesopleuron closely punctured, sometimes with traces of rugosities,

Abdomen: Petiole as long as, or slightly longer than, the hind coxa, its enlarged part beneath the first dorsal plate black with a ferrugi-

nous margin; first dorsal plate black with a ferruginous margin; second, segment ferruginous above and below; third segment ferruginous, mottled or shaded with black, particularly behind; remainder of abdomen black; it is probable that the distribution of ferruginous will vary in different specimens.

Wings: Fore wings fuliginous with violet reflection; hind wings semihyaline basally, somewhat fuliginous beyond the veins; tegulae piceous.

Legs: Black; coxae, trochanters, femora and bases of tibiae with erect hairs; tibiae and tarsi somewhat sericeous, with short, black spines; claws rather ferruginous; no coxal tooth.

Male.—Unknown to me. Cameron says: "The male has the clypeus rounded at the apex, and bears, as does also the face, a sparse silvery pile; and the petiole almost twice the length of the hind coxae." None of these are particularly distinctive features.

Length.—Females, 13—18 mm.

Distribution.—Specimens in the British Museum are marked as from North Sonora, Mexico. I have in my collection a female taken on wild plum blossoms at Placita, New Mexico, 6850 feet, May 5, 1903.

Types.—Cameron evidently had before him both female and male (supposed) of this species. In the British Museum is a female 14½ mm. long, properly marked for locality and collector, and labeled Type in Cameron's writing, and another with the same locality and collector and with the printed label "B. C. A. Hymen. II. *Ammophila sonorensis*, Cam.," but without Cameron's label in writing and not marked type. It was probably in the lot studied by Cameron. Of a male, I could find no trace except a mount of genitalia marked as of *sonorensis*.

This species is apparently far from common. The two specimens in the British Museum and one in my own collection are the only examples met with during an examination of nearly 8,000 specimens of *Podalonia*. It is easily recognized by the clypeal teeth, the fuliginous wings, and by the shape of the abdomen which is rather globular and rises sharply from the petiole. In fact, superficially, it greatly resembles *Chlorion* (*Priononyx*) *bifoveolatum* (Tashenberg) in the last two features.

PODALONIA LUCTUOSA (F. Smith)

Ammophila luctuosa F. SMITH, Cat. Hym. Brit. Mus., vol. 4, p. 224, 1856. Female.

Ammophila luctuosa (Smith) CRESSON, Proc. Ent. Soc. Phila., vol. 4, p. 462, 1865 (part). Female.

Ammophila luctuosa (Smith)? SAUSSURE, Reise d. Novara, Zool., vol. 2, pt. 1, Hym., p. 26, 1867. Female.

?*Ammophila mexicana* SAUSSURE, Reise d. Novara, Zool., vol. 2, pt. 1, Hym., p. 25, 1867. Female and male.

?Ammophila piceiventris CAMERON, Biol. Centr.-Amer., Hym., vol. 2, p. 22, 1888. Female.

Psammophila lucluosa (Smith) MELANDER and BRUES, Biol. Bull., vol. 3, p. 40, 1902. Female.

Ammophila (Psammophila) luctuosa (Smith) MELANDER, Psyche, vol. 10, p. 158, 162, 1903. Female.

Psammophila luctuosa (Smith) H. S. SMITH, Univ. Neb. Biol. Stud., vol. 8, p. 330, 1908. Female.

Sphex (Psammophila) luctuosa (Smith) ROHWER, Bull. 22, Conn. Geol. & Nat. Hist. Surv., p. 681., 1916 (part).

Psammophila luctuosa (Smith) ROHWER, Proc. U. S. Nat. Mus., vol. 53, p. 241, 1917.

Psammophila luctuosa (Smith) MICKEL, Univ. Neb. Studies, vol., 17, p. 87, 1917. Female.

Psammophila luctuosa (Smith) CARTER, Can. Ent., vol. 57, p. 132, 1925 Female, not males.

Jet black, rarely tinged either uniformly or irregularly with brown or piceous; shining; hairs and spines black; claws tinged with ferruginous; wings quite fuliginous, with violet reflection; very variable in size.

Female.—Head: Quite broad; clypeus swollen centrally; its front margin somewhat reflexed except in the middle; rather rounded in outline; its surface somewhat coarsely, closely punctured and bearing long, erect hairs; frons similarly but more closely punctured, as are vertex and cheeks; scape, pedicel and first filament segment of the antennae rather shining, the first often faintly brownish below; the remainder dull; mandible sometimes slightly piceous or chestnut near the middle.

Thorax: pronotum rather high behind, evenly rounded from side to side there, with no median depression or groove; more finely punctured than the head and well clothed with hairs; rugose in front of the prothoracic lobe which is partly smooth and shining; mesonotum quite closely punctured; with a median, longitudinal, depressed line on its anterior half; scutellum rather flatly rounded; punctured, and with traces of rugosities behind; postscutellum dull, finely punctured; propodeal disk rather finely, transverse rugose, closely punctured between the ridges except near its hinder end where the ridges are finer and closer together; end and sides rugose, with rows of punctures between, the rugosities on the sides running rather forward as well as downward; this condition continues forward over the metapleuron onto the mesopleuron, becoming finally a punctured surface only.

Abdomen: Petiole short, straight, hardly longer than hind coxa; abdomen unusually stout, generally very finely sericeous above (fresh specimens); with a few tiny punctures near the hinder margins of the dorsal plates; similar below, but with more punctures; first dorsal

plate rising very sharply from the petiole, sometimes at a right angle or even less.

Wings: Quite uniformly fuliginous with violet to purple reflection; larger veins dark; smaller ones light brown; tegulae black, sometimes rather piceous, particularly on the margin; shining.

Legs: Rather stout, with scattered, coarse punctures and hairs on coxae, trochanters, femora and near the base of the tibiae; tibiae and tarsi weakly whitish sericeous; tibial and tarsal spines stout; pulvilli absent or very small; claws pale.

Male.—I have seen but one male which I consider as certainly this species. Possibilities as to the male are discussed below.

Very small: Clypeus quite elongate downward, its front margin evenly rounded on its outer third, the central third transverse, even slightly emarginate; surface of clypeus and of frons (particularly at

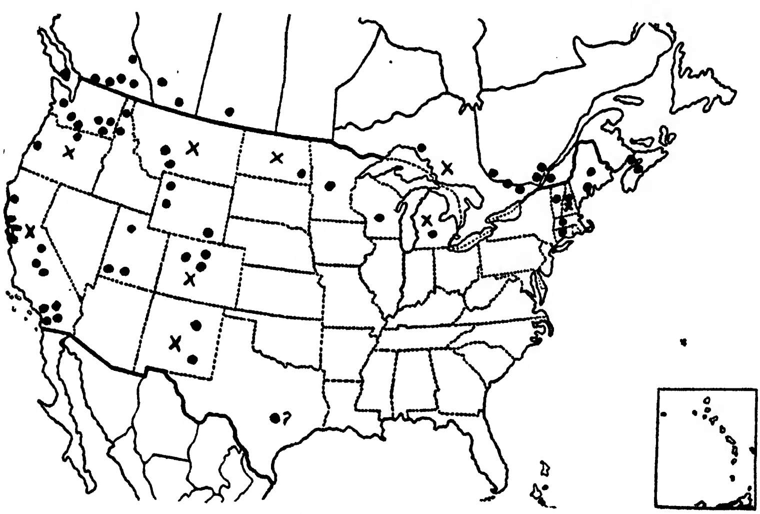

FIG. 2.—MAP ILLUSTRATING THE KNOWN DISTRIBUTION OF PODALONIA LUCTUOSA (SMITH)

the sides of the latter) silvery pubescent well up toward the ocelli: body rugosities fine (probably because of the small size of the specimen); petiole about three-fourths as long as the hind coxa and trochanter together; wings less strongly fuliginous than in the female; legs almost piceous, rather than black; pulvilli large. No trace of ferruginous anywhere.

Length.—Female, 12–20 mm. (one pigmy of 10 mm.); male, 9 mm. (only one seen). Over 350 specimens examined.

Distribution.—Found practically everywhere in the Northern United States and the Southern Canadian territory. I have seen specimens from Nova Scotia and every Province of Canada west to Vancouver; and in the United States from Maine, New Hampshire, Vermont, Massachusetts, Michigan, Wisconsin, Minnesota North Dakota, Montana, Idaho, Washington, Oregon, and California south

to San Diego County; farther south, from Nebraska (Halsey), Colorado, Utah, Wyoming, New Mexico (Cloudcroft, Las Vegas); one specimen from Texas (Austin), one from Meadow Valley, Mexico, and one marked "Alaska? J. A. Kusche 1916." I feel certain that it is present in Connecticut, New York, Pennsylvania, Ohio, and other States in this belt, but it is a northern species and its extensions southward are in the mountainous districts. I suspect the specimen labelled from Texas is incorrectly marked. Dates of capture vary greatly for different localities but two generations a season would appear probable. The blueberry, *Solidago canadensis*, *Spiraea salicifolia*, and *Taraxicum taraxicum* are plants on which this species has been captured.

Types.—Smith evidently had at least three specimens at hand when he described this species, for he gives, "Hab. Nova Scotia; California; Rocky Mountains." I found in the British Museum collection, five specimens which Smith apparently had. One of these, from "Rocky Mounts" was labelled Type in Smith's writing, as well as bearing the printed Museum "Type" label. Another specimen from "Rocky Mounts;" one from California and two from "N. Scotia. Redman" complete the lot.

Saussure's *mexicana* may include examples of *luctuosa* and his northern specimens, at least, of what he calls *luctuosa* are probably that species. This material is presumably at Geneva.

Cameron's *piceiventris* is a problem. In the British Museum is a single female labelled *piceiventris* in Cameron's writing but not marked Type. Its locality label agrees with that for the specimen described, and I believe it to be the type, even though not so labeled, as the description implies only one specimen. The insect itself I should not describe as piceous but dull brownish-red mingled with black, these two colors irregularly placed and not alike on the two sides of the body. I have seen nothing quite like it in material studied and am in doubt whether to regard it as a freak (melanistic?) or a good species. The "other examples from Totonicapam, 8,500 to 10,500 feet," I am unable to separate in any way structurally, from *luctuosa*, but they are more slender. Possibly they represent the condition this species assumes in the southern part of its range. I very much doubt if Cameron was correct in placing them under *piceiventris* in any case.

The males referred to this species by later writers are undoubtedly those of *argentifrons*.

The female of *luctuosa* is ordinarily an easily recognized insect, it being the only one which is black. It is most closely resembled by *argentifrons*, but this is deep blue, more slender, and the abdomen rises less sharply from the petiole than in *luctuosa*.

The male has long been sought for, and following Cresson's guess, many have found it in *argentifrons*, but the female of this last-named species, sometimes confused with *luctuosa*[6] is now known, and *argentifrons* is therefore eliminated from consideration.

In the United States National Museum collection there is a pair of *Podalonias*, the neck of the female gripped by the mandibles of the male as in mating. The female is certainly *luctuosa*, while the male is *violaceipennis*, having several of the abdominal segments bright ferruginous. The pair was taken in "Sept. Placer Lake Cal." and was in the Riley collection.

This pair has given me much trouble. *P. luctuosa*, and *violaceipennis* are both very widely distributed and abont 400 males of *violaceipennis* were available for study, to find, if possible, whether there were really two extremely similiar species in the lot. Many weeks of comparison have given no results in this direction, and the comparison of the male of the pair (even of the genitalia) with the males of several pairs in which the female was undoubtedly *violaceipennis*, also revealed no differences. The conclusion I have finally reached is, that the female *violaceipennis* is sometimes dimorphic, *luctuosa* being one of the female forms, and that in very rare instances the male also becomes entirely black. The only alternative to this, which I can see, is that in the case of the pair from Placer Lake the male made a mistake in the species of female and that true males of *luctuosa* are so rare that only one has thus far come to my attention—a view which seems hardly probable.

In support of the view that we have here a case of color dimorphism in at least one sex (dichromorphism?), the case of *Podalonia hirsuta* (Scopoli) of Europe should be considered. Here, according to Kohl[7] the female usually with ferruginous on the abdomen, is sometimes entirely black. Kohl states that the two should not be considered separate as there is complete agreement in sculpture and plastic relations, and an almost complete lack of black-bodied males. In Corsica the red-bodied females are almost entirely absent, while one finds no black males of the same. Elsewhere he states that among several hundred males examined, he found only two black-bodied ones.

P. hirsuta is very similar to our *violaceipennis* in every way and there is even a slight possibility that it may prove to be the same species. In the female the pulvillus is rudimentary or absent. This is true with our *luctuosa* but not with our female of *violaceipennis*, so that on this point the comparison fails. On the whole it seems best

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[6] Cresson, Proc. Ent. Soc. Phila., vol. 4, p. 462, 1865, and others.

[7] Verh. k. k. zool.-bot. Ges. Wien, vol. 39, p. 21 and p. 275, 1889: Ann. k. k. Naturhist. Mus., Wien, vol. 21, pp. 276-280, 1906.

to leave *luctuosa* as a species separate from *violaceipennis*, for the present, until more pairs have been captured and the evidence they may give becomes available.

Several abnormalities of wing venation have been noted in *luctuosa*. In one specimen of a left wing a vein stub from the middle of the second transverse cubital runs a short distance into the second cubital cell and a similarly located stub projects outward from the third transverse cubital vein; the right wing is normal. In another specimen a similar stub on the third transverse cubital vein enters the second cubital cell, while the other wing is normal. In another case the left fore wing has a petiolated second transverse cubital vein, but contrary to the condition in *Miscus*, the stalk is posterior and the small, triangular, extra cell lies against the radial cell between the second and third cubitals; the right wing is normal. One specimen shows the hinder part of the first discoidal cell almost cut off from the rest by veins from the basal and first recurrent, which run toward each other but do not quite meet. In still another example, the extra vein starts toward the base of the wing from the first recurrent, but soon forks, one fork continuing inward a short distance while the other turns sharply back and joins the discoidal vein near where this and the first recurrent unite, producing a small cell there.

PODALONIA ARGENTIFRONS (Cresson)

Ammophila argentifrons Cresson, Proc. Ent. Soc. Phila., vol. 4, p. 462, 1865. Male.

?*Ammophila mexicana* Saussure, Reise d. Novara, Zool., vol. 2, pt. 1, Hym., p 25, 1867. Female and male.

Psammophila argentifrons (Cresson) Melander & Brues, Biol. Bull., vol. 3. p. 40, 1902.

Ammophila (*Psammophila*) *luctuosa* (Smith) Melander, Psyche, vol. 10, pp. 158, 162, 1903. Male.

Psammophila luctuosa (Smith) Mickel, Univ. Neb. Studies, vol. 17, p. 87, 1917. Male in part.

Psammophila luctuosa (Smith) Carter, Can. Ent., vol. 57, p. 132, 1925. Male in part.

Head, thorax, petiole, and legs black: abdomen blue or blue-black, often brilliant, particularly in the female. Hairs black; frequently brown, with the outer part white in the male; wings more or less fuliginous, least so in the male.

Female.—Here first described, unless *mexicana* Saussure should prove to be this species.

Head: Considerably broader than thorax; clypeus broad, somewhat swollen, its front margin quite transverse, caused largely by a broad, somewhat reflexed, smooth surfaced downward extension from near the middle nearly out to the eyes, thus different from *luctuosa* where the margin is more rounded; surface rather sparsely, coarsely

punctured and with stout hairs; frons more finely punctured and with finer hairs; one markedly larger puncture behind each lateral ocellus nearly in line with this and the median ocellus; inner margins of compound eyes slightly nearer above than below (always?); antennal scape, pedicel and first segment of filament shining, remainder dull; mandibles shining black but with a ferruginous tinge near the middle, varying in strength in different specimens.

Thorax: Prothorax rather sparsely punctured, its sides in front of the prothoracic lobe strongly rugose; the top of the collar in front of the mesonotum rounded laterally but tending toward a higher median portion with a slight depression on each side rather than an even curve; mesonotum sparsely punctured, with distinct median anterior groove; scutellum smooth in front except for a few punctures; slightly rugose behind; postscutellum with a central, oblong-oval area raised above the rest of the plate which is confused in markings, and dull; propodeal disk dull, its surface covered by irregularly transverse ridges, often connected, and with punctures between, and bearing long hairs; end and sides similar except that at the sides of the petiole the ridges are vertical, parallel, and more distinct; near the propodeo-metapleural suture the ridges are not evident; metapleuron dull, covered by somewhat irregular but approximately vertical ridges (sides of propodeum, the meso- and metapleura vary in amount of rugosity in different specimens); mesopleuron irregularly, coarsely punctured, more or less rugose.

Abdomen: Petiole short, stout, straight, only slightly longer than hind coxa, its enlarged end under the first dorsal plate, black; first dorsal plate rising quite sharply from the petiole, but less so than in *luctuosa;* this plate and the rest of the abdomen a rich, deep, rather shining blue—almost navy blue—with scattered, minute punctures most abundant toward the hinder margin of each plate; last plate more uniformly punctured and bearing larger hairs.

Wings: Quite strongly fuliginous with a violet reflection, the hind pair the least, but strongly so beyond the veins; veins piceous to black; tegulae black, sometimes slightly piceous.

Legs: Black, sometimes tinged with piceous to brown; spines of the color of the leg segments to which they are attached; fore-tarsal comb-spines long, of nearly equal diameter from base to tip, the other spines more slender and pointed; claws pale brown; pulvilli moderately developed.

Male.—Body more slender than in the female. Clypeus and frons, to insertion of antennae in the middle and well up toward top of the eyes at the sides, densely silvery pubescent, the hairs forming this being unusually fine and closely decumbent; anterior margin a considerable distance below the eyes, its outer third rounded, its middle transverse, very slightly emarginated.

Thoracic hairs varying from entirely black to black or brown with their outer ends, or more, white.

Petiole almost as long as hind coxa and trochanter together, slightly arched downward on its outer two-thirds; abdomen blue; surface of second and third dorsal plates, particularly near the middle line, more or less covered by very minute, decumbent, white hairs (whitish sericeous) which may also be present to some extent on the plates next in front and behind (in badly worn specimens this may be worn off and it is always better seen from some angles than others); hinder end of last ventral plate slightly truncate; the last three ventral plates are less distinctly blue than the others, and sometimes a brownish tinge may be seen here or there on the abdomen. Rarely, the first and second dorsal abdominal plates have a reddish tinge as though they were trying to become ferruginous.

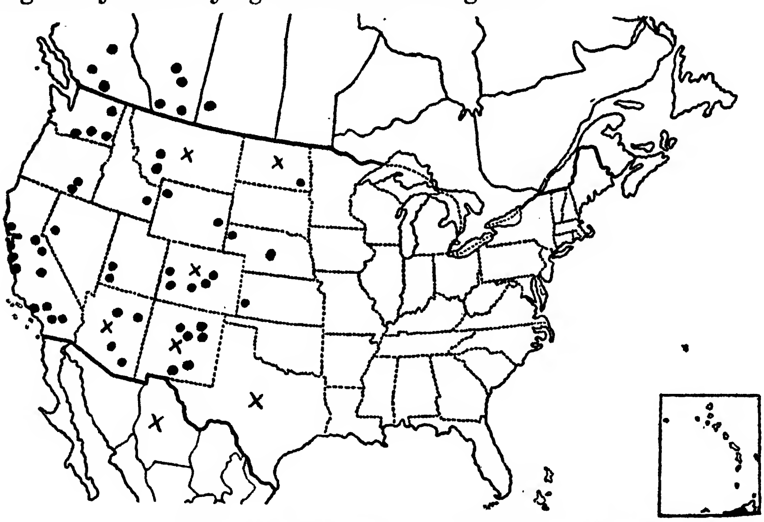

FIG. 3.—MAP ILLUSTRATING THE KNOWN DISTRIBUTION PODALONIA ARGENTIFRONS (CRESSON)

Tegulae black, sometimes with a brownish tinge, and sometimes with a trace of whitish sericeous.

Legs more or less whitish sericeous outwardly.

Length.—Females, 12–17 mm.; males, 11–16 mm. (one male 9 mm.). One hundred and forty-three specimens studied.

Distribution.—I have seen specimens marked "Texas, Belfrage" which would imply central Texas; Kansas (Hamilton County); Nebraska (Ashland, Harrison, etc.); North Dakota (Sheldon and Bowman); Wyoming (Jackson); Montana (Helena and Elkhorn Mountains); Alberta (several localities); British Columbia (Chilcotin, Keremer, and Nicola); Idaho (Rexburg); Washington (Eastern Ritzville, Pullman, and Colville); Oregon (Harney County and Burns); Colorado (many places); Utah (Iron and Beaver Counties); Nevada (Ormsby County); California (general); New Mexico and

Arizona (general). Dates of capture make it appear probable that this species has two generations a year in the southern and one in the northern part of its range.

Types.—Cresson described the male from 20 specimens, one of which he selected later as the type. This is now in the collection of the American Entomological Society. At one time several of the specimens bore a printed "Type" label and these at least should have the rank of paratypes. I saw the collection before the new rating, just indicated, was made and it is my recollection that only four or five bore the Type label and therefore the remainder would rank only as other specimens present in the collection at the time the description was written. Cresson, following his description, made the unfortunate remark: "May be the male of *A. luctuosa* Smith." This has been accepted by several workers as correct, and has led to confusion of the two species to some extent.

Saussure's type, or types, of *mexicana* I have not seen. They are probably at Geneva. The words "abdomine coeruleo" are very suggestive of the female *argentifrons*, but I hesitate to declare *mexicana* a synonym, and leave it to some one who can see Saussure's specimens to settle this point. Melander[8] accepted Cresson's idea that this insect is the male of *luctuosa* as correct, and so sunk Cresson's name as a synonym, and Mickel did the same. I have seen some of the male specimens named *luctuosa* by Carter[9] and they are *argentifrons*.

The descriptions here given of both sexes are from a pair in the collection of the California Academy of Sciences, taken by E. P. Van Duzee, on March 9, 1916, "along the edges of the sand dunes just inside the seashore line about a mile south of the Cliff House and near the radio station, San Francisco,"[10] modified only enough to include certain variations seen in other specimens. The female of this pair is therefore the allotype female of *argentifrons*, unless *mexicana* Saussure proves to be the same. It will be found in the collection of the California Academy of Sciences.

The female of this species has puzzled students of the group from the time when the male was first described. Conclusive evidence on this was first obtained when, in 1918, I found in the collection of the California Academy of Sciences at San Francisco two pairs, on two pins, of these insects, the male in both cases being *argentifrons* and the female not *luctuosa* but an insect hitherto undescribed by any American entomologist. The loan of these specimens has enabled me to prepare the above descriptions of the female and male from a known pair.

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[8] Psyche, vol. 10, p. 158, 1903.
[9] Can. Ent., vol. 57, p. 132, 1925.
[10] E. P. V. in a letter.

The other pair referred to, in the collection of the Academy, showed three specimens of this same species, two males and a female, and was labeled: "Pyramid Pk. at 8,000 ft., El Dorado Co., Cal., VIII, 15, 1902. Coll. by E. C. Van Dyke." Correspondence with Doctor Van Dyke about this capture has produced the following statement from him: "I remember * * * capturing the three specimens, killing them in a separate bottle, and mounting them as noted by you. It was my belief at the time that a male had pounced upon a female and was in the act of mating when a rival pounced upon him and attempted to replace him. Sphecidae caught in the act of mating are none too common so I made an effort to preserve this trio so as to enable whoever worked up my catch to be given as much aid as possible * * *. It has been my habit when collecting Coleoptera to mount pairs upon the same pin whenever they were at all different and in my miscellaneous collecting I have simply carried out the same idea."

Four specimens of those which have come under my observation have abnormal venation, three males and a female. In the female a vein stub from the middle of the second transverse cubital enters the second cubital cell for a short distance, in both wings. In a male from Colorado the second transverse cubital vein in one wing is incomplete and with a cross bar anteriorly, while in the other it has a sharp central bend into the second cubital cell. A California male has an incomplete second transverse cubital running back and out, but not reaching the cubital vein, in both wings. A small male, without data, has three cubital cells on one side, the third barrel-shaped as in *pacifica* Melander and Brues, on one side, while on the other side the second transverse cubital is entirely absent, giving the venation of *Coleoptera*.

One male has been found stylopized.

PODALONIA VIOLACEIPENNIS (Lepeletier)

Ammophila violaceipennis LEPELETIER, Hist. Nat. Ins. Hym., vol. 3, p. 370, 1845. Female.

Ammophila atriceps SMITH, Cat. Hym. Brit. Mus., vol. 4, p. 221, 1856. Female and male.

Ammophila cementaria SMITH, Cat. Hym. Brit. Mus., vol. 4, p. 223, 1856. Female.

Ammophila robusta CRESSON, Proc. Ent. Soc. Phila., vol. 4, p. 461, 1865. Female.

Ammophila communis CRESSON, Proc. Ent. Soc. Phila., vol. 4, p. 462, 1865. Male.

Ammophila alpestris CAMERON, Biol. Centr.-Am., Hym., vol. 2, p. 21, 1888. Male.

Psammophila violaceipennis (Lepeletier) MELANDER and BRUES, Biol. Bull., vol. 3, p. 41, 1902.

Psammophila pacifica MELANDER and BRUES, Biol. Bull., vol. 3, p. 42, 1902, Male.

Ammophila (*Psammophila*) *violaceipennis* (Lepeletier) MELANDER, Psyche, vol. 10, pp. 156, 159, 162, 1903.

Psammophila violaceipennis (Lepeletier) H. S. SMITH, Univ. Neb. Studies, vol. 8, p. 8, 1908. Female.

Sphex (Psammophila) violaceipennis (Lepeletier) ROHWER, Bull. 22, Conn. Geol. & Nat. Hist. Surv., p. 681, 1916.
Psammophila violaceipennis (Lepeletier) ROHWER, Proc. U. S. Nat. Mus., vol. 53, p. 241, 1917.
Psammophila violaceipennis (Lepeletier) MICKEL, Univ. Neb. Studies, vol. 17, p. 88, 1917.
Psammophila violaceipennis (Lepeletier) CARTER, Can. Ent., vol. 57, p. 132, 1925.

Head, thorax, and legs black; abdomen ferruginous and black in varying proportions; wings semihyaline to quite fuliginous; rather slender insects for their length; hairs varying from all black (females generally and some males) to nearly all white, with all gradations between these extremes.

Female.—Hairs on head and body usually black; sometimes white or white-tipped on hinder end of thoracic mass, this condition extending forward different distances in different specimens.

Head: Broad; clypeus swollen centrally; its front margin broadly curved, the outer third reflexed and smooth, its center very slightly emarginate; surface coarsely, quite closely punctured; frons similarly punctured; with an evident, median, depressed line from antennal insertions to median ocellus; antennae black; filament rather brownish sericeous; second filament segment varying from a little over half to nine-tenths the length of the first; mandibles black to piceous; more or less tinged with ferruginous near the middle.

Thorax: Pronotum rather less closely and coarsely punctured than the frons; rugose in front of the prothoracic lobe which is nearly smooth; mesonotum similarly punctured; with an evident, median, depressed line on its front half; scutellum punctured and also slightly rugose; postscutellum with a rather high, transverse ridge centrally; propodeal disk coarsely punctured; with irregular rugosities, becoming rather more regular and transverse behind (quite variable in different examples); its end, near the petiole, and its sides with weak, nearly vertical rugosities; metapleuron rather more sparsely punctured, the punctures tending to lie in nearly vertical rows, producing almost a weakly rugose appearance; mesopleuron rather sparsely and coarsely punctured.

Abdomen: Petiole black; from 68 to 89 hundredths the length of hind coxa and trochanter together (very variable and unreliable as a distinctive character; see Measurements, page 6); abdominal mass ferruginous and black, varying in distribution from ferruginous on posterior margin of first dorsal plate and petiolar expansion beneath, and the second segment, to ferruginous for the entire abdominal mass, though darkened at tip; tip of abdomen with scattered, minute punctures, particularly below.

Wings: More or less fuliginous, particularly beyond the veins; with a violet tinge; veins dark; tegulae varying from black, through black with light margin to entirely pale.

Legs: Black; femora, tibiae, and tarsi whitish sericeous, at least in fresh specimens; spines black; stout; claws and outer tarsal segments tending toward ferruginous; tarsal spines all stout, those of the fore legs long and often holding their basal diameter well out toward the tip; pulvilli well developed.

Male.—Hairs usually black on the head; white, black, or brown, tipped with white, or mixed, elsewhere. White hairs appear first near the hinder end of the thoracic mass and extend forward, first along the sides, later dorsally, until they may cover the entire thorax and even influence those on the head. The first step in the change of color appears to be that the tip becomes white while the basal half remains dark. Clypeal hairs sometimes white.

Head: Clypeus and frons (well up at the sides) silvery pubescent; anterior margin of clypeus considerably below the bottom of the eyes; its margin transverse (sometimes a little rounded), often with a very slight, median emargination; second filament segment of antenna averaging more than three-fourths the length of the first, but quite variable; mandibles black, sometimes faintly tinged with ferruginous in the middle.

Thorax: Scutellum faintly, longitudinally rugose behind; propodeal disk dull black; closely punctured; with more or less evident transverse rugosities behind.

Abdomen: Petiole from slightly shorter to slightly longer than hind coxa and trochanter together; part of the first abdominal dorsal plate and of the petiolar expansion beneath it, with the second segment at least, usually ferruginous, but this may increase to include nearly all of the first dorsal plate and the petiolar expansion in front, and as far backward, in extreme cases, as to affect the seventh segment somewhat (in cases of backward extension of the ferruginous, parts of segments involved may show streaks, spots, or shades of dark; the ventral plate or the sides may be partly or entirely ferruginous, while the dorsal middle is black or dark, or *vice versa*); terminal ventral plate rounded at the sides, truncate at the end, with a slight, broad emargination.

Wings: Generally less deeply fuliginous than in the female; veins dark. In specimens from arid regions these may be lighter, even almost honey-yellow.

Legs: Tibiae and tarsi whitish sericeous; outer tarsal segments tending, sometimes quite strongly, toward ferruginous.

Length.—Females, 12–21 mm.; males, 10.5–20 mm. Five hundred and fifty nine examples studied; many others examined less carefully. The males appear to be far more abundant than the females, the division in this number being: Males, 397; females, 162. This may, of itself, have some bearing on the possibility that *luctuosa* is a female form of this species.

Variation.—A series of specimens from Sausalito, Calif., and single examples from New Mexico and elsewhere show slight differences from the more usual form of *violaceipennis* and for a time I considered them representatives of a closely related but undescribed species. In these specimens the females are shorter and stouter; have a petiole no longer, and sometimes even shorter, than the hind coxa; the lateral third of the margin of the clypeus and the side of this plate near the eye, nearly half way up to the antennal insertion, are smooth; the mandible has pronounced ferruginous color in its middle and the under side of the antennal scape is tinged with ferruginous.

In the male (one specimen from the Sausalito lot) it is almost impossible to find any difference from the usual male *violaceipennis* except that it is shorter and stouter.

Examination of a long series of specimens has failed to separate these entirely from the usual form, however. There are varying degrees of stoutness; intermediate conditions on the clypeus between close punctures and none, on the areas above indicated; gradations from mandibles entirely black to those strongly ferruginous in the middle, and variations in color on the under side of the scape, from black all the way to the ferruginous tinge, together with great variations in the length of the petiole compared with that of the hind femur and trochanter. Beginning with the extreme forms and arranging specimens in a series, from these toward the typical form of the species, shows that Cresson's *robusta*, in structure and proportions, stands about in the middle of the row, at the other end of which is the typical *violaceipennis*. Whether this will justify varietal names is open to question but, if at all, the extreme condition at least should be indicated, and specimens of this type may be termed variety *compacta*. Specimens of this extreme degree of variation have therefore been designated as follows: Holotype female from Sausalito, California; allotype male from Sausalito, California; paratype female from "Mt. Shasta dist. Cal." in the collection of the American Museum of Natural History, New York; two paratype females from "Cal." in the collection of the American Entomological Society at Philadelphia; one paratype female from "Cave Spg., N.M., Albert" in the collection of the United States National Museum.

Distribution.—Generally distributed over the southern portions of Canada from Nova Scotia to Vancouver Island, with one specimen from Fort McLeod, British Columbia (about latitude 55°), and throughout the Northern United States from Maine to Washington. Farther south I have seen specimens to Pennsylvania; then from North Carolina and Florida. Westward it has been taken in Indiana, Illinois, Kansas, Nebraska, Colorado, Nevada, Oregon, and California. In the more southerly localities I have seen examples from New

Mexico, Arizona, Mexico (Meadow Valley) and elsewhere, and Costa Rica. In Kansas it has been taken on *Melilotus alba;* in North Dakota on *Erigeron philadelphicus* and *Cleome serrulata,* and in Montana on alfalfa flowers. A specimen from Colorado has on the pin with it a naked larva (probably of a Noctuid) about 27 mm. long, and specimens have been reared by C. N. Ainslee, in Utah, from cutworms.

Types.—Lepeletier's type of *violaceipennis* was in the Serville collection and its locality is given as "Philadelphie." I have been

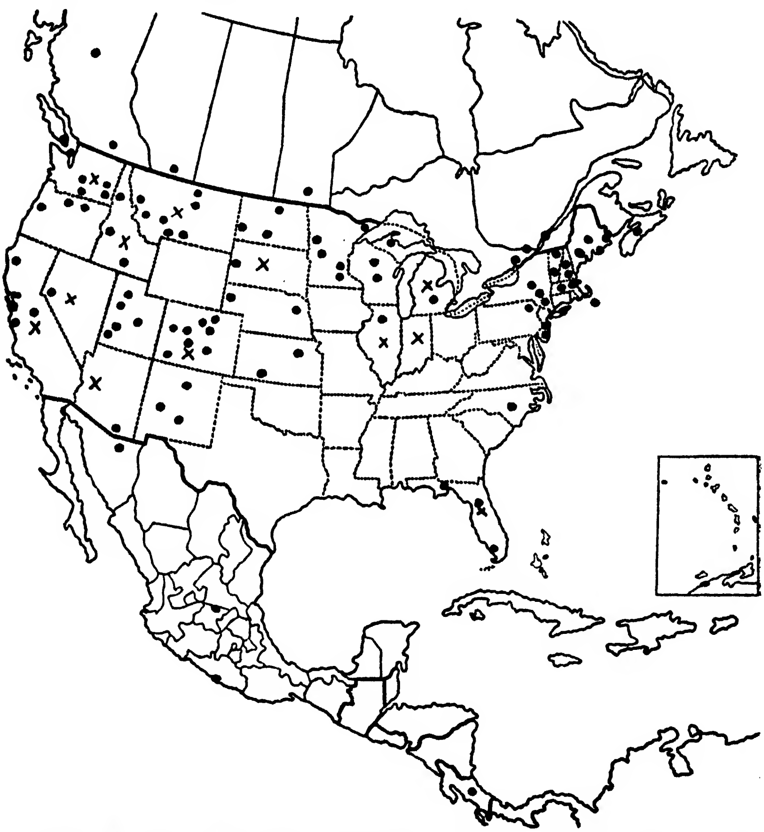


FIG 4.—MAP ILLUSTRATING THE KNOWN DISTRIBUTION OF PODALONIA VIOLACEIPENNIS (LEPELETIER)

unable to find this insect though I made a long search for it at the Muséum d' Histoire naturelle at Paris, nor any material of the Serville collection. What has become of this collection I have been unable to learn. I am entirely in agreement with Melander, however, that the insect described above is that species.

There are three specimens in the British Museum which should be considered in connection with Smith's *atriceps.* Smith described this species, female and male, from Mexico. One of the three specimens bears a circular label marked "43" above "14" on one side, and

"Mexico" on the other; and an oblong label on blue paper, marked "*atriceps* Sm." in Smith's writing. Each of the other two bears a circular label with numbers on one side and "California" on the other. These must be thrown out of consideration as types, not being from the proper locality. As all three are males, Smith's female type is apparently lost, and the male first mentioned above may not be the original type specimen. It is authoritatively marked as *atriceps* by Smith himself, however, and is from the proper locality, and may therefore be considered an authentic specimen for comparison. It is the same as *violaceipennis* as here recognized and described.

Smith described *cementaria* from a female, or females, the only clue to the number he examined being the localities he lists, which are: "St. John's Bluff, East Florida; Georgia." There are six specimens in the British Museum which Smith evidently studied at one time or another, but as two of these are marked "N. America," and the third has no locality label, these can not be the types. These three are also marked "Smith coll. pres. by Mrs. Farren White 99–303." It is on record that Smith's first set of exotic Hymenoptera went to the British Museum and the remainder went to Mr. Farren White and after his death went to the Museum. This leaves three specimens for consideration as type of this species. All are females and the female only, was described. Of the three, one is labelled (1) "Type;" (2) "E. Doubleday. St. John's Bluff E. Florida" printed; (3) "*Ammophila cementaria* Smith (Type)" in Smith's writing; (4) "F. Sm. Coll. Type 79.22." Another is labelled (1) "Type;" (2) "35 Harris's lab. 496 E. Doubleday St. John's Bluff E. Florida;" (3) "*cementaria* Smith Georgia," apparently in Smith's writing; (4) "F. Smith Coll. Type 79.22." The third is marked (1) "Georgia," a printed label; (2) "*Ammophila cementaria* Smith Cotype," apparently in Smith's writing; (3) "*cementaria* Smith Georgia" also apparently written by Smith; (4) "F. Smith Coll. Type 79.22." This last label, borne by all three, I am informed was put on each pin when the Smith collection was acquired by the Museum and that the word "Type" was written on by Kirby. This would remove these labels from primary consideration in selecting the type specimens, and the "Type" label on the first two is the regular Museum label, not put on by Smith. The second specimen is credited both to East Florida and to Georgia, raising a doubt as to the reliability of one of the labels. Label No. 3 on the first specimen above is marked Type, in parenthesis, which was not Smith's usual practice, at least as is shown by numerous other labels of his in the Museum. Was it added by someone else later? Label 2 on the third specimen bears the word "cotype." This is the only case of the use of this word by Smith, which I have met with. Did he write it or was it added later?

The only conclusions I can reach as to the standing of these specimens are that they were all probably in Smith's hands at the time he described the species, and that the third is probably the Georgia specimen. Of the other two, the second has the reliability of its labels affected by the contradictory locality statements, and I am of the opinion that as between the three, the first should be considered the type (Lectotype) and the third, the Georgia specimen mentioned in connection with this description. These specimens are undoubtedly *violaceipennis* as here interpreted.

Cresson described *robusta* from eight female specimens. At first several of these bore printed "Type" labels but later he designated one as the type, which would leave the others as probably of paratype rating. The type, and several of the other specimens at least, are in the collection of the American Entomological Society where I have studied them. It is *violaceipennis*, but from arid or semiarid regions, with a correspondingly greater area of ferruginous than in eastern specimens.

To the species *communis*, described by Cresson from 40 male specimens, the statements made for *robusta* apply equally well. It is the average arid or semiarid region coloration of the male *violaceipennis*.

Of *Ammophila alpestris* Cameron I found five specimens in the British Museum marked as belonging to the Biologia collections, one of them labeled "*Ammophila alpestris* Cam. Type" in Cameron's writing and from the locality given with his description. It is undoubtedly the type, though the length measurements he gives show that he consulted the other specimens. It is an arid region male *violaceipennis*, being rather extreme in that even the long hairs on the front of the head are white. I was unable to make the third antennal segment (first filament) one-half longer than the fourth, as stated by Cameron, but it is well within the range of variation found in *violaceipennis*.

Psammophila pacifica Melander and Brues was described from one male specimen collected at Pacific Grove, California, based on a peculiarly shaped third cubital cell, strongly convergent eyes, white pubescence, and very slender form. The third cubital cell is unusual in form, being barrel shaped, but I have seen specimens similar to this on one wing and quite normal on the other. The white pubescence, if by this the close, decumbent pubescence on the face, is meant, is normal to all male *Podalonias*, but if it is the long hairs which is meant, as is more probable, considering the rest of the description, I am totally unable to find them on the type, the long hairs on the head being black. The eyes are no more convergent than is often the case in males, this being a usual sexual feature. I am unable to consider this specimen as other than a small example of male *violaceipennis* with a third cubital cell of rather unusual form.

This very widely distributed insect has been perhaps the greatest sufferer in the genus, from the belief of the older workers on Sphecids, both in this country and in Europe, that color area was a reliable means of distinguishing species. The result was that a specimen with two ferruginous abdominal segments was considered different from one having three, four, or more of that color. Variation in the color of the hairs and the place where they ceased to be white and became black has also caused trouble, and other varying characters have also contributed to the confusion.

For more than three years I labored to find some reliable separation of the species here listed as synonyms of *violaceipennis*, studying long series of specimens again and again, and even making mounts of the genitalia and last ventral abdominal plate, but without success. Finally I arranged the material geographically and at once order began to come out of chaos, a series of beautiful gradations developing, closely paralleled by humidity conditions in different regions. A similar study in the genus *Sphex*[11] gave exactly similar results, and, in the same way, the various species listed under the bibliography of *violaceipennis* all fell into line.

Abnormal venation in this species is sometimes met with. In one specimen seen the left fore wing has the second transverse cubital vein forked in its anterior half, forming an extra, triangular cell against the radial cell, and in that region separating the second and third cubital cells. The fore wing of the other side is normal. More or less barrel shaped third cubital cells are sometimes met with, and various other abnormalities occasionally occur.

SPECIES OF UNCERTAIN POSITION

PODALONIA JASON (Cameron)

Ammophila jason CAMERON, Biol. Centr.-Amer., Hym., vol. 2, p. 20, 1888. Female.

A study of Cameron's type gives the following facts: Clypeal margin rounded, with four slight, rounded projections located about where the teeth are in *valida* but not like teeth. Possibly the teeth might wear down to this condition. Antennal scape shining, almost piceous; third antennal segment one-third longer than the fourth (not "more than twice the length of the fourth" as Cameron writes). The wings are more fuliginous than in average specimens of *valida* but this specimen is from Guatemala and *quadridentata* is an evidence how a related form from the South is dark; the markings on the propodeal shield differ somewhat from those in typical *valida* but are well within the limits of variation of this part; the legs are not sericeous but this is liable to wear off in old specimens and the clypeal teeth suggest that this may have been the case.

[11] See Ann. Ent. Soc. Amer., vol. 19, p. 88, 1926.

PODALONIA MEXICANA (Saussure)

Ammophila mexicana Saussure, Reise d. Novara, Zool., vol. 2, pt. 1, Hym., p. 25, 1867. Female and male.

I have not seen Saussure's types of this species. So far as the description goes I can find no statements which would prevent this from being *argentifrons* Cresson.

The original description is as follows:

"*Nigra, nigro-hirta, abdomine coeruleo, alis pallide fumatis, cyanescentibus.—Long. corp. 0.016; alae 0.011* .

♀ Nigra, breviter nigro-vel cinereo-hirta. Clypeus et mesonotum crasse, caput et prothorax tenuius punctata. Pronotum medium postice et mesonotum antice sulco divisa. Mesonotum supra et scutellum nitida, sparse punctata. Postscutellum tuberculo instructum. Metanotum transversim striatum et rugosum, supra utrinque sulcatum et in medio obsolete sulco tenui divisum, lateribus sulco obliquo valde notatis. Abdomen coeruleum; petiolo subbrevi, paulo magis quam dimidium primi segmenti efficiente. Alae fumatae, violaceo-micantes; tertia areola cubitalis extus rotundata (scilicet antice et postice coarctata).

♂ Minor, gracilis; clypei apice truncato, margine subconcavo et utrinque rotundato clypeo et facie capitis valde argentatis.

Variat.: *a* Alis subhyalinis, margine apicali griseo-cyanescente.—*b* Alis plus minusve obscurioribus.

In agro mexicano frequens; in Cordilleris orientalibus (Cordoba, Sangolica) et etiam in campis altioribus et frigidioribus (Teshuitlan, et in valle urbis Mexico) specimina numerosa cepi."

PODALONIA MORRISONI (Cameron)

Ammophila morrisoni Cameron, Biol. Centr.-Amer., Hym., vol. 2, p. 21, 1888. Male.

The only specimen I could find in the British Museum is labeled "*Ammophila morrisoni* Cam. Type" in Cameron's writing, but is a female though Cameron figures the genitalia of the male and describes it as a male. Someone has placed this insect under *sonorensis* in the collection. The description says: "The long, silvery-white hair is long, moderately dense, and almost uniformly distributed." The specimen above referred to has no white hairs. Cameron gives the length as 21 mm., while this specimen is 14 mm. Cameron says that there is no central mesonotal furrow, while this specimen has one. In other regards also, this insect does not agree with the description and I am of the opinion that his label has, in some way, gotten onto the wrong specimen. I did not see anywhere in the collection an insect which did seem to meet the description of this species.

In many ways Cameron's description seems to agree with the male of *nicholi* Carter and this may prove to be a synonym. Until more evidence on this point can be obtained, however, the two may well be kept separate.

PODALONIA PICEIVENTRIS (Cameron)

Ammophila piceiventris Cameron, Biol. Centr.-Amer., Hym., vol. 2, p. 22, 1888. Female and variety.

One female in the British Museum bears Cameron's written label "*Ammophila piceiventris* Cam." but without the word "Type," and the locality label is that given for the type. The description reads as though prepared from a single specimen and I consider the example as probably the type, even though it is not so labeled.

I have seen nothing quite like this specimen, in coloration, elsewhere. Cameron's description uses the word piceous, but to me the color is nearer a brownish-red. This is evident on the petiole, abdomen, legs, clypeus, frons, vertex, cheeks, and all plates on the sides, but everywhere mingled with black (almost mottled).

Structurally it is very similar to *luctuosa* though more slender. The clypeal margin somewhat resembles that of *sonorensis*, but is without teeth, and the hairs, like *sonorensis*, have a bluish color at some angles.

I can not place this insect with any of those treated in this article, and consider it either as a good species or a color freak, either of *luctuosa* (which I greatly doubt) or of *violaceipennis*.

The varieties mentioned by Cameron are, in my opinion, southern examples of *luctuosa*. Structurally and in color they agree with this species and the only difference I can see is that the specimens are somewhat more slender.

EXPLANATION OF PLATES

These drawings were made from enlarged photographs on which the lines desired were traced, the picture then erased, and the line drawings thus produced were again enlarged by photography. This explains a slight lack of symmetry, in some of the figures, due to difficulty in getting the insect exactly posed.

PLATE 1

FIG. 1. Side view of *Podalonia valida* (Cresson). *c*—collar of prothorax; *e*—eye; *lm*—levator muscle; *mn*—mesonotum; *msc*—mesocoxa; *mspl*—mesopleuron; *mtc*—metacoxa; *mtpl*—metapleuron; *n*—neck of prothorax; *oc*—ocelli; *pc*—procoxa; *pl*—prothoracic lobe; *prd*—propodeal disk; *pre*—propodeal end; *prs*—propodeal side; *sp*—spiracle; *t*—tegula; 1–6 (above)—abdominal nota; 1–6 (below)—abdominal sterna; 1 (below) is also the petiole.

2. Dorsal view of *Podalonia valida* (Cresson). *lm*—levator muscle; *mn*—mesonotum; *pd*—propodeal disk; *pn*—pronotum; *ps*—propodeal side; *psc*—postscutellum; *sc*—scutellum; *sp*—spiracle; *t*—tegula; *w*—wing; 1—petiole (sternum of first abdominal segment as counted in this paper).

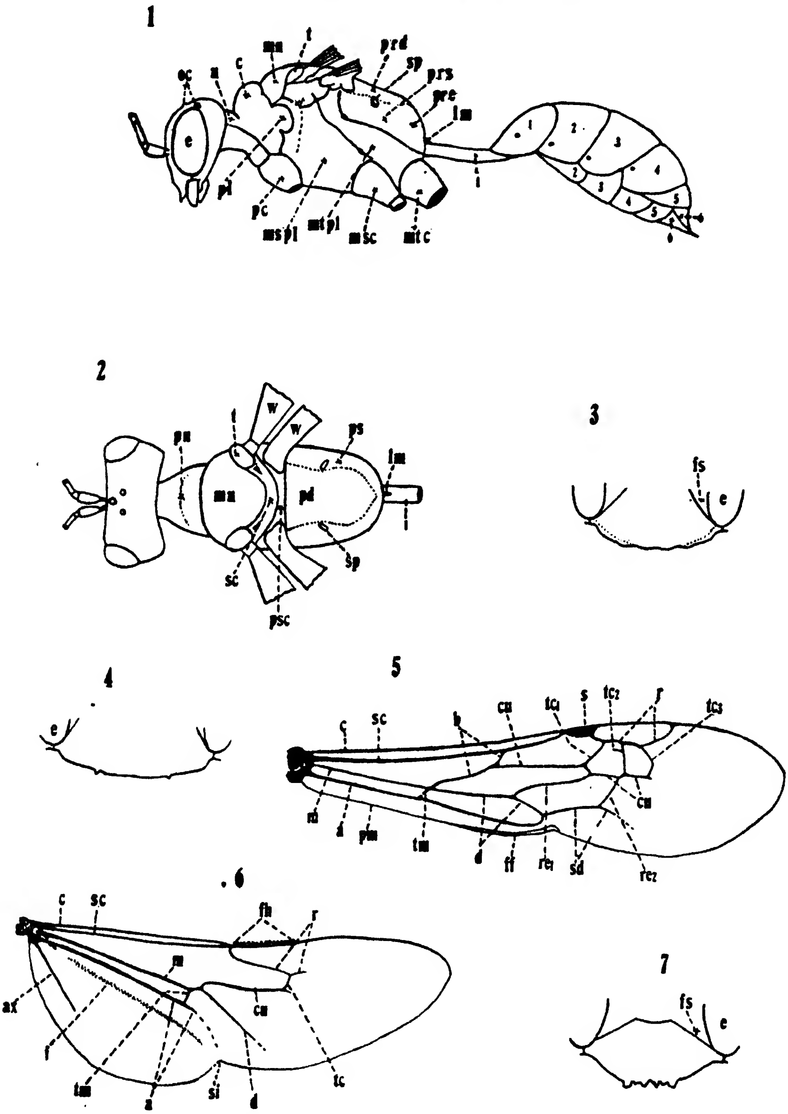
3. Usual form of clypeal margin in *Podalonia violaceipennis* (Lepeletier) female. *e*—compound eye; *fs*—side of frons between clypeus and eye.

4. Clypeal margin of *Podalonia sonorensis* (Cameron) female. *e*—compound eye.

5. Fore wing of *Podalonia* with names of the veins as used in this paper. *a*—anal; *b*—basal; *c*—costal; *cu*—cubital; *d*—discoidal; *ff*—frenal fold; *m*—median; *pm*—posterior margin; *r*—radial; re_1—first recurrent; re_2—second recurrent; *s*—stigma; *sc*—subcostal; *sd*—subdiscoidal; tc_1—first transverse cubital; tc_2—second transverse cubital; tc_3—third transverse cubital; *tm*—transverse median.

6. Hind wing of *Podalonia* with names of veins as used in this paper. *a*—anal; *ax*—axillary; *c*—costal; *cu*—cubital; *d*—discoidal; *f*—fold; *fh*—frenal hooks; *m*—median; *r*—radial; *sc*—subcostal; *si*—sinus; *tc*—transverse cubital; *tm*—transverse median.

7. Clypeus of *Podalonia valida* (Cresson) female. *e*—compound eye; *fs*—side of frons between clypeus and eye.



DETAILS OF PARTS OF DIGGER WASPS

FOR EXPLANATION OF PLATE SEE PAGE 40

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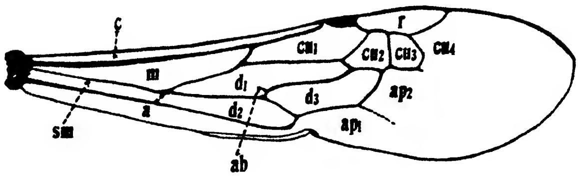

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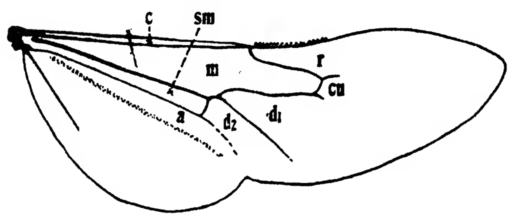

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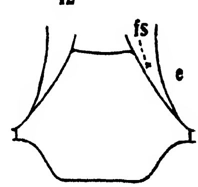

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DETAILS OF PARTS OF DIGGER WASPS

FOR EXPLANATION OF PLATE SEE PAGE 41

PLATE 2

FIG. 8. Fore wing of *Podalonia* with names of the cells as used in this paper *a*—anal; *ab*—an aberrant vein stub very frequently present; ap_1—first apical; ap_2—second apical; *c*—costal; cu_1—first cubital; cu_2—second cubital; cu_3—third cubital; cu_4—fourth cubital; d_1—first discoidal; d_2—second discoidal; d_3—third discoidal; *m*—median; *r*—radial; *sm*—submedian.

9. Hind wing of *Podalonia* with names of the cells as used in this paper. *a*—anal; *c*—costal; *cu*—cubital; d_1—first discoidal; d_2—second discoidal; *m*—median; *r*—radial; *sm*—submedian.

10. Hind tibial spine of *Sphex* showing fine teeth.

11. Hind tibial spine of *Podalonia* showing coarse teeth.

12. Clypeus of male *Podalonia* of almost any species. *e*—compound eye; *fs*—side of frons between clypeus and eye.

13. Mandible of *Podalonia.*

INDEX

Valid names and those of uncertain standing are in Roman type, synonyms in italics.

NOTES ON FISHES OBTAINED IN SUMATRA, JAVA, AND TAHITI

By Henry W. Fowler
Of the Academy of Natural Sciences, Philadelphia

AND

Barton A. Bean
Of the United States National Museum

INTRODUCTION

In October, November, and December, 1925, Lieut. H. C. Kellers, United States Navy, during the Solar Eclipse Expedition obtained in Java and Sumatra representatives of 100 species of fishes, and in June, 1925, Mr. J. Morgan Clements, of New York, while on a cruise along the north coast of Tahiti, Society Islands, collected representatives of 25 species, all of which have been deposited in the United States National Museum, and as but few collections of fishes from the Dutch Indies find their way into American museums we have prepared the present paper, in which several forms of exceptional interest are noted in detail and one is described as new.

To the already extensive bibliography of Sumatran fishes reference may here be made to that of Fowler in the Journal of the Academy of Natural Sciences of Philadelphia (ser. 2, vol. 12, 1904, pp. 557–559).

1. FISHES COLLECTED IN SUMATRA AND JAVA DURING THE NAVAL SOLAR ECLIPSE EXPEDITION, 1925, BY LIEUT. H. C. KELLERS, UNITED STATES NAVY

Family CLUPEIDAE

1. **DUSSUMIERIA HASSELTII Bleeker.**

Three, 52 to 71 mm. long, from Benkoelen.

2. **HARENGULA BRACHYSOMA (Bleeker).**

One 113 mm. long. Benkoelen.

3. **ILISHA BRACHYSOMA (Bleeker).**

One 88 mm. long, December 19, 1925.

4. **OPISTHOPTERUS MACROGNATHUS Bleeker.**

One 116 mm. long, November, 1925.

Family ENGRAULIDAE

5. **ENGRAULIS KAMMALENSIS** Bleeker.

Three from Benkoelen, 27 to 77 mm. long, November, 1925. In these the maxillary does not quite reach the edge of the gill-opening. A narrow, faint, gilt lateral streak.

6. **ENGRAULIS PURAVA** (Buchanan-Hamilton).

One 43 mm. long, November, 1925.

7. **ENGRAULIS VALENCIENNES** Bleeker.

Three 96 to 130 mm. November, 1925.

Family MASTACEMBELIDAE

8. **MASTACEMBELUS MACULATUS** Cuvier.

One 95 mm. long, from rice field near Kipahiang, January 4, 1926.

Family ECHIDNIDAE

9. **LYCODONTIS UNDULATUS** (Lacépède).

One 125 mm. long, from Poeloe Toekus Island, Indian Ocean, December 19, 1925. Dark in color and greatly suggestive of *Gymnothorax hilonis;* another, 48 mm. long, has tip of jaws and two bands on head white.

10. **UROPTERYGIUS CONCOLOR** (Rüppell).

One from Poeloe Toekus Island, 138 mm. long; collected November, 1925.

Family CYPRINIDAE

11. **CYPRINUS CARPIO** Linnaeus.

Seven from rice fields near Kipahiang; January 26, 1926.

12. **BARBUS BINOTATUS** (Van Hasselt).

Twenty, 33 to 73 mm. long, January 6, 1926, and 17, 29 to 76 mm., January 22, 1926, same locality as last.

13. **BARBUS BUNTER** Bleeker.

Barbus bunter BLEEKER, Nat. Tijds. Ned. Indie, vol. 13, 1857, p. 350. Rio Tjidani Tjampea, West Java.

Puntius (*Barbodes*) *bunter* BLEEKER, Atlas. Ichth., vol. 3, 1863, p. 101, pl. (38) 139, fig. 3.

Head, $3\frac{4}{5}$ to $4\frac{1}{8}$; depth, $2\frac{2}{5}$ to $2\frac{1}{2}$; D. III, 8, 1; A. III, 1, or 9, 1; scales, 23 or 24 in lateral line to caudal base and two more on latter; 5 scales above lateral line, 4 below; 8 to 10 predorsal scales; snout, 3 to $3\frac{1}{2}$ in head; eye $2\frac{4}{5}$ to 3, greater than snout, $1\frac{1}{8}$ to $1\frac{1}{5}$ in interorbital; maxillary, $2\frac{4}{5}$ to 3 in head; interorbital, $2\frac{3}{5}$ to $2\frac{4}{5}$. Body ovoid, well compressed, back elevated, predorsal with slight median keel; caudal peduncle compressed, least depth 1 to $1\frac{1}{5}$ its length or $1\frac{4}{5}$ to 2 in head.

Head width, $1\frac{3}{4}$ to $1\frac{4}{5}$ in its length; snout convex, obtuse, its width $\frac{2}{3}$ to $\frac{4}{5}$ its length; eye large, high, little anterior in head; maxillary small, reaching two or slightly behind front eye edge. Bar-

bels 4, anterior 2½ in eye, posterior 2. Nostrils close together, situated in last third of snout. Interorbital broadly convex. Gill rakers 3 plus 9 short weak points, ⅛ of gill filaments, which is 1¾ in eye. Scales with 11 or 12 radiating striae; circuli very fine; scales on body all large, well exposed, forming broad basal sheaths to dorsal and anal; also extended over caudal base. Ventral axillary scale, ⅗ of fin. Scales on breast small. The lateral line arches slightly below median axis of body and along lower side of caudal peduncle; tubes slender and well exposed. First three rays of dorsal osseus, hind margin of the third serrated; long tip flexible; first branched ray slightly longer than head. Anal small, entirely behind dorsal, first three rays stiff, third robust though much thinner than third dorsal spine; third simple anal ray 1⅖ to 1⅗ head. Caudal deeply forked,

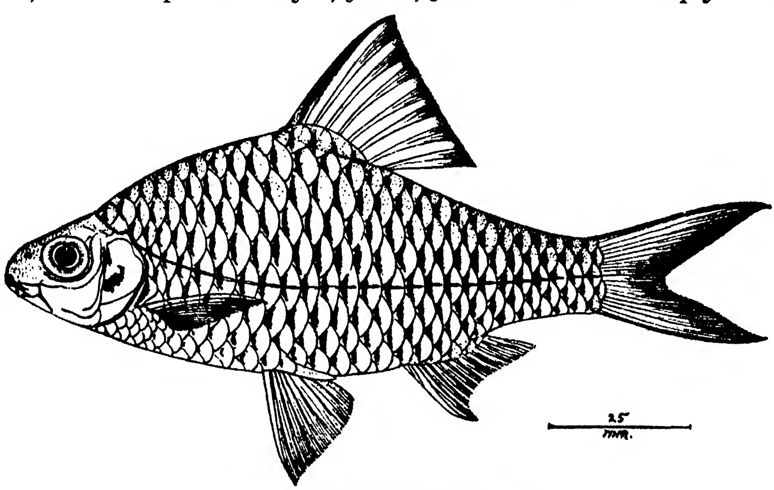


FIG. 1.—BARBUS BUNTER BLEEKER

its slender pointed lobes being contained 2⅔ to 3 in the combined head and body length. Pectoral 1 to 1⅛ in head; ventral 1⅛ to 1⅕.

Color in spirits, back brown with light lavender to bluish metallic shades; sides and below silvery white; base of each scale with a dusky cresent blotch; head brownish above, with a dusky blotch on opercle below; iris silvery white; dorsal and anal pale grayish; margins narrowly dusky to blackish; lower fins whitish; ventral with slight gray tint.

Three specimens, 123 to 137 mm. long, Moesi River at Lahat, were taken January 25, 1926. These agree with Bleeker's figure in most every way and are interesting as a rediscovery of the species. The type was 115 mm. long and lost after Bleeker figured it.

14. RASBORA ARGYROTAENIA (Bleeker).

Nine from rice fields near Kipahiang, January 6, 1926. Length 37 to 56 mm.

Family BAGRIDAE

15. **GLYPTOTHORAX PLATYPOGONOIDES** (Bleeker).

Two with same locality as last species, 40 mm. January 14, 1926.

Family BELONIDAE

16. **STRONGYLURA STRONGYLURA** (Van Hasselt).

One from Benkoelen, 260 mm. December 13, 1925.

Family HEMIRAMPHIDAE

17. **ZENARCHOPTERUS DISPAR** (Valenciennes).

Seven from Benkoelen, 156 to 160 mm. December 13, 1925.

Family HOLOCENTRIDAE

18. **HOLOCENTRUS RUBER** (Forskål).

One from Poeloe Toekus Island, 181 mm. November, 1925.

Family OPHICEPHALIDAE

19. **OPHICEPHALUS STRIATUS** (Bloch).

Seven from the Moesi River, Palembang, 82 to 225 mm. January 29, 1926.

Family HELOSTOMIDAE

20. **HELOSTOMA TEMMINCKII** (Valenciennes).

With same data as last, 23 examples, 37 to 80 mm.

Family POLYACANTHIDAE

21. **POLYACANTHUS HASSELTI** (Valenciennes).

Two with same data as last, 127 to 140 mm.

Family OSPHRONEMIDAE

22. **TRICHOPODUS TRICHOPTERUS** (Pallas).

Same date as last, 29 examples, 44 to 80 mm.

Family ANABANTIDAE

23. **ANABAS TESTUDINEUS** (Bloch).

Also with same data as last 4 species, 56 examples, 43 to 132 mm.

Family ATHERINIDAE

24. **ATHERINA DUODECIMALIS** (Valenciennes).

Five from Benkoelen Beach, 93 to 105 mm. November, 1925. Agrees with Weber and Beaufort's account, though with slightly fewer lateral scales, 38 to 40, as compared with 42 to 45.

Six from same locality, 33 to 105 mm. December 19, 1925.

Family MUGILIDAE

25. MUGIL CERAMENSIS (Bleeker).

From Benkoelen, 28 examples, 35 to 54 mm. November, 1925.

Four from Benkoelen, 30 to 34 mm. December 19, 1925.

D. VI–I, 8, I; A. III, 9. Scales 30, transversely 12 at soft dorsal origin. Small scale in pectoral axil. No adispose eyelid. Pectoral 1⅘ to 1½ in head. Maxillary visible. Silvery, back blue gray. Below white, fins pale.

26. MUGIL DUSSUMIERI (Valenciennes).

At Benkoelen, 232 examples, 16 to 124 mm. December 13–19, 1925.

A. II, 9. Scales 30. Eye long as snout, with adipose lids. Maxillary visible. First anal spine inserted nearer caudal base than snout tip; front half of anal before soft dorsal. Pectoral little shorter than head. Axillary pectoral scale 2⅘ in fin.

26 a. MUGIL VAIGIENSIS (Quoy and Gaimard).

From Benkoelen, 30 examples, 24 to 74 mm. November, 1925. Dorsals and anals terminally and upper band on pectoral black.

Also 30 from same locality December 19, 1925, 14 to 30 mm.

Family SPHYRAENIDAE

27. SPHYRAENA BARRACUDA (Walbaum).

Six from Benkoelen Beach, 30 to 110 mm. December 19, 1925. Black band on head and row of black spots on trunk.

Family TRICHIURIDAE

28. TRICHIURUS HAUMELA (Forskål).

One from Benkoelen, 238 mm. November, 1925. Eye 2 in snout. Anal as minute spine. Upper third of dorsal dusky.

One from same locality, 263 mm. long, December 19, 1925.

Family CARANGIDAE

29. CARANX SEXFASCIATUS (Quoy and Gaimard).

One from Benkoelen, 76 mm. December, 1925.

30. SCYRIS INDICA (Rüppell).

One from Benkoelen, 65 mm. December 19, 1925. Like Day's figure of *Caranx gallus* though ventral little longer.

Family LEIOGNATHIDAE

31. LEIOGNATHUS EQUULA (Forskål).

One from Benkoelen, 52 mm. December 17, 1925. Chest naked, spinous dorsal uniformly pale, lower preopercle edge finely serrated.

32. LEIOGNATHUS BLOCHI (Valenciennes).

One from Benkoelen beach, 75 mm. December 19, 1925.

33. LEIOGNATHUS SPLENDENS (Cuvier).

One from Benkoelen, 93 mm. November 1925.

34. SECUTOR INSIDIATOR (Bloch).

One from Benkoelen, 57 mm. November, 1925.

35. SECUTOR RUCONIUS (Buchanan-Hamilton).

From Benkoelen 57 examples, 28 to 45 mm. November, 1925.

Family CHEILODIPTERIDAE

36. AMIA SANGIENSIS (Bleeker).

Fifteen from Benkoelen, 43 to 59 mm. November, 1925.

Family AMBASSIDAE

37. AMBASSIS GYMNOCEPHALUS (Lacépède).

One from Benkoelen, 56 mm. December 19, 1925.

Family SERRANIDAE

38. SERRANUS MERRA (Bloch).

One from Poeloe Toekus Island, 175 mm. November 25, 1925.

Also 1 from same locality, 185 mm. December 20, 1925. Largely yellowish with brown to dusky blotches.

39. SERRANUS TAUVINA (Forskål).

One from Benkoelen, 175 mm. December, 1925. D. XI, 15; A. III, 8. Scales 93 + 10, transversely 17 and 25; tubes 59 + 5 in lateral line. Pectoral 1¾ in head. Scales mostly aliated. Maxillary with patch of small scales. Opercular spines equidistant. Interorbital three-fourths of eye. Caudal convex behind.

Family PEMPHERIDAE

40. PEMPHERIS ADUSTUS (Bleeker).

One from Poeloe Toekus Island, 198 mm. December 20 to 25, 1925 Dark blotch at pectoral base, also front edge of dorsal and upper and lower caudal edges. Agrees with Bleeker's figure.

Family LUTJANIDAE

41. LUTJANUS KASMIRA (Forskål).

One from Benkoelen, 140 mm. December 13, 1925.

42. LUTJANUS OLIGOLEPIS (Bleeker.)

Three from Poeloe Toekus Island, 180 to 230 mm. November 25, 1925. Back brown, each scale with basal gamboge blotch and below with rosy tinge. Black blotch below front of soft dorsal on lateral line. Fins all with dull grayish tinge. Iris pale rosy purplish. Like Bleeker's figure, with second anal spine less than third. The smallest example differs in 6 horizontal gamboge lines below lateral line.

43. LUTJANUS MARGINATUS (Cuvier).

One from Poeloe Toekus Island, 203 mm. November 25, 1925.

Three from Benkoelen, 34 to 52 mm. November, 1925. These without dark lateral blotch. Dorsals and caudal dusky. Small spine at angle of serrated preopercle edge.

44. LUTJANUS RIVULATUS (Cuvier).

One from Poeloe Toekus Island, 215 mm. November 25, 1925.

Family POMADASIDAE

45. PLECTORHINCHUS CRASSISPINUS (Rüppell).

Two from Benkoelen, 40 to 73 mm. December, 1925. Agrees with Day's figure. Both show posterior two-thirds of tail abruptly white and borders of soft dorsal and anal broadly white, latter 2 fins broadly blackish submarginally.

46. POMADASIS MACULATUS (Bloch).

Two from Benkoelen, 83 to 126 mm. November, 1925. Smaller example with isopod crustacean attached to base of caudal fin.

Family THERAPONIDAE

47. THERAPON JARBUA (Forskål).

Two from Benkoelen, 25 to 32 mm. November, 1925.

Twenty-eight from same locality, 14 to 57 mm. December 19, 1925.

Family LETHRINIDAE

48. PENTAPUS AUROLINEATUS (Lacépède).

One from Poeloe Toekus Island, 716 mm. November 25, 1925. Soiled gray white with ill-defined dull yellowish longitudinal band. Iris straw yellow. Rays of most fins with pale buff.

Family GERRIDAE

49. GERRES FILAMENTOSUS (Cuvier).

Three from Benkoelen, 17 to 28 mm. November, 1925. Scales above lateral line 6. Depth, $2\frac{2}{3}$. Second dorsal spine not elongated. Nine transverse dark bands on sides. Spinous dorsal and caudal largely grayish marginally.

50. GERRES ABBREVIATUS (Bleeker).

Two from Benkoelen, 26 to 100 mm. December 13 to 19, 1925. Agree with the figures by Bleeker and Day, though only edge of spinous dorsal dusky and hind caudal edge pale, like rest of fin. Scales above lateral line to spinous dorsal origin 5, in lateral line 55. Second dorsal spine $1\frac{1}{4}$ in head. Broad scaleless groove in interorbital for premaxillary projections.

Family MULLIDAE

51. UPENEOIDES VITTATUS (Forskål).

Two from Benkoelen, 98 to 100 mm. December 13 to 19, 1925.

52. UPENEOIDES TRAGULA (Richardson).

One from Benkoelen, 42 mm. December 19, 1925.

53. MULLOIDES AURIFLAMMA (Forskål).

One from Poeloe Toekus Island, 315 mm. November 25, 1925. Brilliant gamboge band from eye to upper caudal lobe basally. Sides of head and body with rose copper tints. Back brown. Iris pale

coppery. Barbels and muzzle pale greenish white or sage green. Vertical fins citron yellow, paired fins paler.

Family SCIAENIDAE

54. **SCIAENA DUSSUMIERI** (Valenciennes).

One from Benkoelen, 84 mm. December 17, 1925. Scales ctenoid. Color quite dark, most of fins more or less deep dusky.

Family SILLAGINIDAE

55. **SILLAGO SIHAMA** (Forskål).

Thirty-one from Benkoelen, 26 to 90 mm. November, 1925.

Twelve from same locality, 38 to 85 mm. December 19, 1925.

Family EPHIPPIDAE

56. **DREPANE PUNCTATA** (Linnaeus).

One example from Benkoelen, 70 mm. November, 1925.

Family TOXOTIDAE

57. **TOXOTES JACULATOR** (Pallas).

Two from Benkoelen, 88 to 103 mm. December 13, 1925.

Family CHAETODONTIDAE

58. **CHAETODON TRIFASCIATUS** Mungo Park.

Two from Poeloe Toekus Island, 88 to 105 mm. November, 1925.

One from same locality, 110 mm. December 20, 1925.

59. **CHAETODON VAGABUNDUS** Linnaeus.

Three from Poeloe Toekus Island, 118 to 133 mm. December 20 to 25, 1925.

60. **CHAETODON RAFFLESII** Bennett.

Two from Poeloe Toekus Island, 120 and 121 mm. Largely greenish yellow with orange tinge on lower side.

61. **CHAETODON LINEOLATUS** Cuvier.

One from Poeloe Toekus Island, 210 mm. November, 1925.

Family ACANTHURIDAE

62. **HEPATUS TRIOSTEGUS** (Linnaeus).

One from Benkoelen beach, 28 mm. December 19, 1925.

One from Poeloe Toekus Island, 170 mm. December 20, 1925.

63. **CTENOCHAETUS STRIGOSUS** (Bennett).

One example from Poeloe Toekus Island, 160 mm. November, 1925.

Family SIGANIDAE

64. **SIGANUS JAVUS** (Linnaeus).

One from Benkoelen, 106 mm. December 13, 1925.

65. SIGANUS CONCATENATUS (Valencie

Two from Poeloe Toekus Island, 285 mm. November, 1925. Neutral gray to drab above, below gray white, covered with bright yellow spots.

Two from Benkoelen, 135 to 138 mm. December 13, 1925.

Family SCORPAENIDAE

66. PTEROIS VOLITANS (Linnaeus).

One from Benkoelen, 126 mm. November, 1925.

Family CARACANTHIDAE

67. CARACANTHUS UNIPINNA (Gray).

Four from Poeloe Toekus Island. 32 to 38 mm. December 19–20, 1925.

Three from same locality, 28 to 38 mm. November, 1925.

Family PLATYCEPHALIDAE

68. PLATYCEPHALUS INDICUS (Linnaeus).

One from Benkoelen, 170 mm. November, 1925.

Family PLEURONECTIDAE

69. PLATOPHRYS PANTHERINUS (Rüppell).

Four from Benkoelen, 28 to 112 mm. December, 1925.

Two with same locality, 93 to 98 mm. December, 1925.

Family SOLEIDAE

70. CYNOGLOSSUS SUMATRENSIS (Bleeker).

One from Benkoelen, 98 mm. November, 1925. Depth, $4\frac{1}{5}$. Scales, 68 from gill opening to caudal base; 2 lateral lines, 12 scales between.

Family POMACENTRIDAE

71. POMACENTRUS TRIPUNCTATUS Cuvier.

One from Poeloe Toekus Island, 62 mm. November, 1925. Dull olive, little paler below. Pectoral and caudal with yellow. Very small dusky dot at pectoral origin.

72. ABUDEFDUF SAXATILIS (Linnaeus).

One from Poeloe Toekus Island, 90 mm. November, 1925. Back pale greenish, cross bands neutral dusky, less wide than greenish.

73. ABUDEFDUF UNIMACULATUS (Cuvier).

One from Benkoelen, 88 mm.

Family LABRIDAE

74. HALICHOERES MINIATUS (Valenciennes).

One from Benkoelen, 62 mm. December 16, 1925.

75. HALICHOERES NEBULOSUS (Valenciennes).

One from Benkoelen, 93 mm. December 16, 1925.

76. HALICHOERES PAPILIONACEUS (Valenciennes).

One from Benkoelen, 96 mm. December 19, 1925.

77. HALICHOERES JAVANICUS (Bleeker).

One from Benkoelen, 77 mm. December 19, 1925. Though discolored by formaline agrees fairly well with Bleeker's figure. Black spot at pectoral axil very distinct, also scattered dark spots on body scales. Fins now all uniform. Dark postocular blotch not pronounced.

Family CALLYODONTIDAE

78. CALLYODON SORDIDUS (Forskål).

One from Poeloe Toekus Island, 321 mm. November 25, 1925. Green line along edge of lower lip arches up toward lower eye edge and then down toward pectoral origin. Also green line along upper lip close to edge, then to eye and continued above posteriorly. Slight green bar from lower hind eye edge. Dorsals with bright green borders and median row of green blotches, rest of fin gray green. Anals green, with median neutral gray longitudinal band. Caudal bright green. Paired fins more or less bright green to yellowish.

79. CALLYODON FASCIATUS (Valenciennes).

One from Poeloe Toekus Island, 353 mm. No canines. Edges of median lateral scales dull yellowish. Greenish lines radiate from eye. Edges of dorsals green, also upper and lower caudal edges. Anal with basal green band and broader marginal. Pectoral with green edge above.

Family ELEOTRIDAE

80. ELEOTRIS FUSCA (Schneider).

Two from Benkoelen, 55 to 60 mm. November, 1925.

One from same locality, 48 mm. December 19, 1925.

81. ELEOTRIS WARDII Playfair.

Eleotris wardii PLAYFAIR, Fishes of Zanzibar, 1866, p. 73, pl. 9, fig. 3. Zanzibar.

Head, 3⅗; depth 5¼; D. VI–I, 12; A. I, 12, I; scales about 95 in median lateral series and 6 more in caudal base; 28 scales transversely; snout, 3¼ in head from snout tip; eye 4½; maxillary, 2⅗; interorbital, 2 in eye.

Head width, 2 in its length. Eye, 1½ in snout. Maxillary reaches middle of eye. Lower jaw projects. Outer teeth little enlarged, with small canine each side below anteriorly and directed backward. Gill, opening lateral, 2⅔ in total head length.

Scales with 8 or 9 basal radiating striae and row of 7 or 8 strong apical denticles; circuli moderate. Head, chest, and pectoral base naked, scales minute or obsolete on predorsal. Third dorsal spine,

1⅘ in total head length; last dorsal ray, 3; last anal ray, 2⅙; least depth of caudal peduncle, 3; pectoral, 1⅗; ventral, 1½.

Color in alcohol largely pale brownish, with slight olive tinge. Several small, pale grayish ocelli on preorbital and few larger ones scattered on cheek, opercle and preopercle. Fins all pale. Spinous dorsal with black apical blotch large as pupil.

Length, 45 mm.

One example from Benkoelen. December 19, 1925. It agrees with Playfair's figure though is younger. Its color pattern is less elaborate and the pale oblique bar on the side of the head is represented by spots.

82. **BUTIS BUTIS** (Buchanan-Hamilton).

One example, 105 mm. This and the next two species obtained at Batavia, Java, October, 1925.

Family GOBIIDAE

83. **GLOSSOGOBIUS GIURUS** (Buchanan-Hamilton).

One example, 123 mm.

84. **EUCTENOGOBIUS CRISTATUS** (Day).

Two examples, 120 mm.

85. **GOBIODON CITRINUS** (Rüppell).

Four from Poeloe Toekus Island, 36 to 42 mm. December 20, 1925. Uniformly pale.

Three dark brown examples, same data, 34 to 36 mm.

One from same locality in November, 1925. All show traces of vertical lines in head.

86. **GOBIUS ORNATUS** Rüppell.

Ten from Benkoelen, 60 to 99 mm. December 19, 1925.

87. **GOBIUS CRINIGER** Valenciennes.

One from Benkoelen, 78 mm. December 14, 1925.

88. **BATHYGOBIUS FUSCUS** (Rüppell).

One from Benkoelen, 42 mm. December 19, 1925.

89. **BATHYGOBIUS POECILICHTHYS** (Jordan and Snyder).

Two small examples from Benkoelen, December 19, 1925. Head, 3¾; depth, 4⅗; D. VI–I, 9, I; A. I, 8; scales, 35+3, transversely 15; snout, 4½ in head from snout tip; eye, 3; maxillary, 3⅕; interorbital, 2⅔. Agree on comparison with a series of examples from Tanegashima Island, Japan.

90. **PERIOPHTHALMUS KOELREUTERI** (Pallas).

Two from Benkoelen, 53 to 58 mm. November, 1925.

Family CALLIONYMIDAE

91. **CALLIONYMUS SAGITTA** Pallas.

Two from Benkoelen, 65 to 68 mm. November, 1925. Differ from Day's figure [1] in that the eye is long as snout, Day showing eye twice

[1] Fishes of India, pt. 2, 1876, pl. 68, fig. 5, females.

snout. Interorbital 2½ in orbit, Day says eyes "closely approximating" while Valenciennes gives one-third. Our examples with blackish blotch on preorbital and *antero-infra orbital*, also chin and mandible anteriorly covered with close set blackish dots.

92. CALLIONYMUS KELLERSI, new species.

Head, 2⅛; depth, 6⅛; D. IV, 9, 1; A. 9, 1; P. 22; V. I, 5. Snout, 4 in head; eye, 6; maxillary, 3; interorbital, 6½.

Body greatly depressed anteriorly, widest at pectoral bases. Caudal peduncle well compressed, its length 4¾ in that of head. Head width 1½ its length; snout depressed, length ⅚ its width at front of eyes. Eye large, superior, 1⅔ in snout; equal to interorbital.

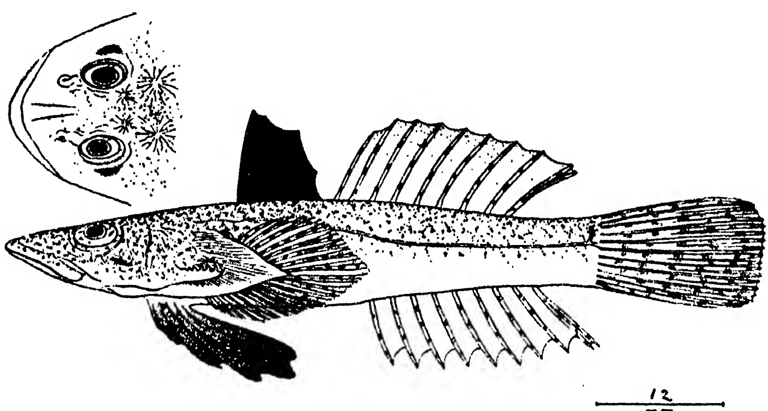


FIG. 2.—CALLIONYMUS KELLERSI FOWLER AND BEAN, TYPE

Mouth broad, lower jaw slightly shorter; maxillary reaches opposite front eye edge; band of fine teeth in jaws rather narrow. Nostrils nearer eye than end of snout. Interorbital level about equals eye. Several postocular cranial patches of radiating striae covered with thin skin. Preopercle limb robust, compressed, with five strong teeth above, all directed upward. Gill-opening small, above pectoral orgin. Skin smooth, naked. Lateral line superior on trunk, median along side of tail. Dorsals separated, though close; spines flexible; first 3⅓ in head; rays uniform, subequal. Anal begins behind soft dorsal origin, and last rays posterior to soft dorsal; rays similar and edge notched. Caudal oblong, 1¾ in head, hind edge truncate. Pectoral with broad base, reaches anal orgin. Ventral long as pectoral, rays well branched

General color in alcohol grayish brown; belly and under surface of head grayish white; back and upper surface of head with numerous

obscurely defined dots, specks and variable broken lines of dusky gray; sides and lower lateral regions with dull gray shades; spinous dorsal neutral black; soft dorsal and anal with as many as four dark spots on each ray, fins otherwise light grayish; caudal similar, but with a few more spots; pectoral pale, upper rays with dark spots; ventral neutral, dusky neutral, black terminally. Length 73 mm.

Type.—Cat. No. 87935, U.S.N.M.

Benkoelen, Sumatra, November, 1925. Lieut. H. C. Kellers, collector.

Related to *Callionymus opercularioides* Bleeker, but differs in that the interorbital width equals eye, whereas in Bleeker's species the eye is contained twice in the same width; also Bleeker species is blackish.

Named for its discoverer Lieut. H. C. Kellers.

Family BLENNIIDAE

93. **SALARIAS MARMORATUS** Bennett.

One from Benkoelen, 62 mm. long, December 14, 1925.

94. **SALARIAS LINEATUS** Valenciennes.

Four from Benkoelen, 55 to 64 mm. long. December 14, 1925.

One from same locality, 59 mm. long. December 19, 1925.

95. **SALARIAS EDENTULUS** (Schneider).

One from Benkoelen, 83 mm. December 19, 1925. Supraocular tentacle palmate and fringed.

96. **SALARIAS PERIOPHTHALMUS** Valenciennes.

One from Benkoelen, 70 mm. December 14, 1925.

Two from same locality 62 to 72 mm. December 19, 1925.

Family BALISTIDAE

97. **BALISTES CHRYSOPTERUS** (Schneider).

One from Poeloe Toekus Island, 130 mm. December 20, 1925.

98. **BALISTAPUS UNDULATUS** (Mungo Park).

One from Poeloe Toekus Island, 135 mm. November, 1925. Fins largely yellowish, brighter basally.

Family TETRODONTIDAE

99. **SPHOEROIDES LUNARIS** (Schneider).

Two from Poeloe Toekus Island, 140 to 205 mm. November 25, 1925.

100. **SPHOEROIDES OBLONGUS** (Bloch).

Four from Benkoelen, 42 to 72 mm. November, 1925.

2. FISHES COLLECTED BY MR. J. MORGAN CLEMENTS IN TAHITI, NORTH COAST, SOCIETY ISLANDS, DURING JUNE, 1925.

Though none of the species listed are new, several are interesting records for this group of Polyneisan Islands.

Family HOLOCENTRIDAE

1. **HOLOCENTRUS LACTEOGUTTATUS** Cuvier.

Eight examples, 75 to 93 mm. Dotted with dusky on back.

Family SYNGNATHIDAE

2. **CORYTHOICHTHYS CONSPICILLATUS** (Jenyns).

Thirteen examples, 93 to 108 mm.

Family MUGILIDAE

3. **MUGIL CRENILABIS** Forskål.

Six examples, 54 to 72 mm.

Family CHEILODIPTERIDAE

4. **AMIA CRASSICEPS** Garman.

One example, 41 mm. Head, 2⅞; depth, 2⅝; D. VI–I, 9; A. II, 7; scales, 23+2?, 2 above lateral line, 7 below, 6? predorsal; snout, 4 in head; eye, 3; maxillary, 1⅞; interorbital, 4.

Family KUHLIIDAE

5. **KUHLIA MARGINATA** (Cuvier).

Nine examples, 40 to 140 mm.

6. **KUHLIA TAENIURA** (Cuvier).

One example, 33 mm. Agrees with Garrett's figure as published by Günther. Color largely uniformly silvery. Caudal with 2 black oblique bands besides the median band.

Family MULLIDAE

7. **UPENEUS BIFASCIATUS** (Lacépède).

One example, 142 mm.

Family ACANTHURIDAE

8. **HEPATUS TRIOSTEGUS** (Linnaeus).

Six examples, 30 to 95 mm.

9. **ACANTHURUS UNICORNIS** (Forskål).

Three examples, 93 to 131 mm.

Family SIGANIDAE

10. **SIGANUS RIVULATUS** (Forskål.

Two examples, 117 to 130 mm. These stained dark but agree very well with Günther's figure of *Teuthis nebulosus*. Ventrals with 3 dark blotches. Caudal with 4 or 5 dark cross bands, obsolete medianly on fin.

Family SCORPAENIDAE

11. **PTEROIS ANTENNATA (Bloch).**

Two examples, 67 to 120 mm.

Family POMACENTRIDAE

12. **ABUDEFDUF LACRYMATUS (Quoy and Gaimard).**

Two examples, 80 to 112 mm. Like Günther's figure.

13. **ABUDEFDUF BIOCELLATUS (Quoy and Gaimard).**

Two examples, 33 to 37 mm. Without black ocelli on dorsal.

14. **ABUDEFDUF GLAUCUS (Cuvier).**

Six examples, 72 to 93 mm. Compared with examples from Samoa and Riu Kiu and found to agree in every respect.

15. **ABUDEFDUF IMPARIPENNIS (Vaillant and Sauvage).**

Six examples, 54 to 61 mm. All show the dark vertical band through the eye wide as the pupil. Agree with Hawaiian examples.

Family ELEOTRIDAE

16. **ELEOTRIS FUSCA (Schneider).**

Twelve examples, 90 to 168 mm. long. Mr. Clements observed these as rock-climbing fish. Native name Oopu.

Family GOBIIDAE

17. **BATHYGOBIUS FUSCUS (Rüppell).**

Five examples, 55 to 92 mm. long.

Family BLENNIIDAE

18. **SALARIAS SALIENS (Forster).**

Fifteen examples, 37 to 93 mm.

19. **SALARIAS EDENTULUS (Schneider).**

Three examples, 83 to 120 mm. long.

20. **SALARIAS MARMORATUS Bennett.**

Two examples, 80 to 95 mm.

21. **SALARIAS LINEATUS Valenciennes.**

Forty-four examples, 20 to 100 mm.

22. **SALARIAS CAUDOLINEATUS Günther.**

One example, 58 mm.

23. **SALARIAS PERIOPHTHALMUS Valenciennes.**

Three examples, 103 to 160 mm.

Family CARAPIDAE

24. **CARAPUS HOMEI (Richardson).**

One example, 80 mm.

Family CANTHIGASTERIDAE

25. **CANTHIGASTER SOLANDRI (Richardson).**

Three examples, 52 to 60 mm.

O

NOTES ON THE MELITAEID BUTTERFLY EUPHYDRYAS PHAËTON (DRURY), WITH DESCRIPTIONS OF A NEW SUBSPECIES AND A NEW VARIETY

By Austin H. Clark

Curator of Division of Echinoderms, United States National Museum

INTRODUCTION

One of the most interesting of the common butterflies of eastern North America is *Euphydryas phaëton.* Its extreme localization, its abundance in the very restricted areas inhabited by it, its extreme sluggishness under ordinary conditions, and its most unusual tenacity of life combine to distinguish it from all other of our butterflies. In addition, there are the curious and rather frequent variations and aberrations to which, like all its close relatives, it is subject. Furthermore, the pupae and the caterpillars in all stages show features quite as interesting as those of the adults.

Casual experience with the early stages of this butterfly in the field showed that there was still much to be learned in regard to it, and accordingly during the autumn of 1925 and the spring of 1926 an intensive study covering all the stages was undertaken.

The actual work was largely carried out by Messrs. Austin B. J. Clark and Hugh U. Clark under my supervision. Many of the observations herein given were first made by them, and the present paper is to be regarded as a joint contribution by all three of us.

Most of our studies were on specimens from the vicinity of Washington. These we find to represent a different race from that represented by those with which we were previously familiar in New England; for this race we propose the name

EUPHYDRYAS PHAËTON SCHAUSI, new subspecies

Plate 1, figs. 5–8

Characters.—Closely resembling *Euphydryas phaëton phaëton* (pl. 1, figs. 1–4) from eastern Massachusetts, but with the ground color of the upper surface of the wings deep velvety black, usually, but not always, duller and more grayish in the females, instead of blackish brown, and the light markings white instead of light straw yellow; on the fore wings the orange spots in the middle and at the tip of the cell are usually much reduced and commonly (occasionally in the

northern form) entirely absent; the eight orange spots along the margin of the wing are smaller, due to the broadening of the band of black scales along the veins between them and a rounding off of their outer angles by an invasion of black scales; they are frequently very much reduced in size, especially in the females, and may be almost wholly obliterated by black scales; in the northern form the three apical spots are usually noticeably larger than the others, extending inward between the veins for a greater distance, but in the southern form these spots may be all of the same size, as is usual in the females, or they may decrease regularly from the apex posteriorly, as is usual in the males; on the hind wings there is very seldom any trace of orange except for the submarginal row of spots, which are restricted by a broadening of the narrow black border of the wings and a heavier development of black scales along the veins, especially in the females; beneath, the marginal band of orange spots is narrower than in the northern form with a more deeply crenate inner margin, and the orange markings in the basal half of the hind wings are more or less reduced by a greater development of black along the veins and an invasion of black on all sides; the light markings on the under side are also purer white than in the northern form.

We take great pleasure in naming this form for our friend Dr. William Schaus, who first took it at Alexandria, Virginia, several years ago, and whose specimens we have been privileged to study in connection with our own.

Comparisons.—For comparison with our specimens from Cabin John, Maryland, we have before us a series of nine examples from Stoneham, Massachusetts, which were collected on June 27, 1926, and sent to us by our friend Mr. C. V. Blackburn; a female from Lincoln, Massachusetts, July 7, 1923; a female from Weston, Massachusetts, July 9, 1923 (pl. 1, figs. 3, 4); and three males from Newtonville, Massachusetts, July 11, 1923, and June, 1897, all taken by ourselves. Of the northern form we have also examined four males from Kendall, New York, three males and three females from New Jersey, and a male without locality. Of the southern form we have examined, in addition to our own series, five males and five females from Alexandria, Virginia, collected by Doctor Schaus.

We find no difficulty in distinguishing specimens from New Jersey and northward from those from the vicinity of Washington. Typical examples of each are very distinct, because of the deeper and more lustrous black of the latter, the brighter white of the light spots, and the restriction of the orange markings.

One of the specimens from Stoneham, Massachusetts, is nearly as deep black as the southern form; but it has the typical orange markings of the northern. Four of the specimens from Cabin John are

somewhat brownish; but the restriction of the submarginal orange spots, especially on the fore wings, easily distinguishes them. Three of these have both the orange spots in the cell of the fore wing present, though reduced, and the fourth has the outer present, rather broadly divided in the middle; one has faint indications of the two orange spots in the inner part of the hind wings.

Size.—We have measured the maximum expanse of 186 specimens.

The 116 males were found to range from 45.0 to 64.0 mm., averaging 52.7 mm.

The 70 females were found to range from 50.4 to 70.2 mm., averaging 60.4 mm.

There is no appreciable difference in size between northern and southern examples.

The 17 males from New Jersey and northward range from 49.4 to 60.0 mm., averaging 54.5 mm. The 99 males from the vicinity of Washington range from 45.0 to 64.0 mm., averaging 52.5 mm.

The 8 females from New Jersey and northward range from 54.0 to 69.8 mm., averaging 59.5 mm. The 61 females from the vicinity of Washington range from 50.4 to 67.8 mm., averaging 60.3 mm.

The two largest specimens are a female from Newtonville, Massachusetts (69.8 mm.) (pl. 2. figs. 13, 14), and another from Missouri (70.2 mm.).

In studying this butterfly one gets the impression that in the North there is less difference in size between the sexes than in the South, the males being larger and the females smaller; but the figures show very little difference.

In the South the extremes in size are slightly more in the males (a difference of 19.0 mm.) than in the females (17.4 mm.), while in the North the reverse would seem to be the case, the range in the females (15.8 mm.) being greater than that in the males (10.6 mm.); but our northern material is not sufficient to enable us to speak with any degree of certainty.

Frequency of different sizes in Euphydryas phaëton

Millimeters	Males		Females	
	Vicinity of Washington	New Jersey northward	Vicinity of Washington	New Jersey northward
45–47	6	0	0	0
48–50	23	1	1	0
51–53	34	4	1	1
54–56	28	9	9	2
57–59	5	2	11	0
60–62	2	1	19	2
63–65	1	0	15	2
66–68	0	0	5	1
69–71	0	0	1	1

Variation in the shape of the wings.—In the males the fore wings are more or less produced (pl. 1, figs. 1, 2, 5, 6; pl. 2, figs. 15, 16; pl. 3, figs. 19–22; pl. 4, figs. 25–32). From the apex the border runs backward and outward, curving broadly around at the third submarginal red spot and running thence in a straight (pl. 1, figs. 1, 2) or slightly concave (pl. 4, figs. 26, 27) line to the inner angle. The curve at the third red spot is usually well marked, and if the border beyond is concave it may even be somewhat abrupt. Occasionally this broad angulation of the fore wing is entirely lacking, and the border curves smoothly from the apex to the fourth red spot, thence running straight to the lower angle (pl. 3, fig. 23). Males of this last type, with the fore wings relatively short and broad, are inactive like the females from which they are not easy to distinguish either in the field or in the cabinet. The most active males are the smaller ones with the most produced fore wings (pl. 4, figs. 26, 27).

The shape of the hind wings in the males varies as much as that of the fore wings. When the fore wings are markedly produced the edge of the hind wings from the third red spot onward runs in a line which is only moderately convex to the well-marked anal angle (pl. 4, figs. 26, 27, 29). There are all gradations between this typical form and hind wings which are evenly and broadly rounded, indistinguishable in shape from those of typical females (pl. 3, fig. 23; pl. 4, fig. 31).

The fore wings of the females (pl. 1, figs. 3, 4, 7, 8; pl. 2, figs. 9–14; pl. 3, figs. 17, 18, 24; pl. 5, figs. 33–40) are relatively shorter than those of the males, and are more rounded. From the apex (pl. 1, figs. 3, 4, 7, 8) the margin runs backward and outward curving broadly around the fourth red spot and running in a slightly convex line to the inner angle. Rarely the margin of the fore wings curves regularly and evenly from the apex to the inner angle (pl. 5, figs. 33, 34). On the other hand, the fore wings of the females may be produced much as in the males (pl. 5, fig. 37), but in this case the maximum height of the convexity is at the fourth red spot instead of at the third, and the margin between it and the inner angle is very rarely concave.

The hind wings of the females (pl. 1, figs. 3, 4, 7, 8) have an evenly rounded border in the majority of cases, but rather frequently the border beyond the third red spot is much less convex than normal (pl. 5, fig. 33), so that the hind wings approach the form typical of that of the male.

In both sexes there is often a curious lack of correlation in the form of the fore and the hind wings. In the males broadly and evenly rounded hind wings are sometimes found with strongly produced fore wings (pl. 4, fig. 31), while in the females broadly

rounded fore wings may occur with hind wings of the shape found in the males (pl. 5, fig. 40).

While in the great majority of cases the shape of the wings enables the males and females to be differentiated at a glance, all possible gradations may be found between the extreme male and female types both of the fore and of the hind wings. Males occur with wings one would unhesitatingly pronounce female (pl. 3, fig. 23), and females occur with wings just as emphatically male.

On making routine determinations of the sex of our series of this butterfly we found that an unusually large specimen which on the wing form had been tentatively determined as a male was in reality a female, and we at first thought that we had found a female with male wings. Later a small specimen with typically female wings (pl. 3, fig. 23) turned out to be a male. We now believe that these represent normal, though rare, variants and can not be considered as gynandromorphs.

Variation in color.—The broader variations in the amount of red on the wings has already been considered. It may be further mentioned that occasionally the red spots on the under side of the hind wings, excepting the marginal, are so speckled with black scales as to appear a deep maroon, and that in one specimen on the under side of the hind wings the spot in the cell and the spots forming the submedian band, except for the hindmost, are dull yellow instead of red, the other red spots being normal.

In the males reduction of the white markings on the upper surface is very frequent (pl. 3, fig. 21; pl. 4, fig. 26). This reduction does not affect the outermost row of spots, just within the submarginal lunules, which thus become increasingly prominent. On the hind wings the lunules are sometimes so reduced that only the merest traces remain, while on the fore wings there are only vestiges of the lunules and of the spots in the row just within that adjacent to the lunules.

On the other hand there may be a very considerable increase in the number of the white spots. In one example (pl. 3, figs. 19, 20) the submarginal lunules on the hind wings are unusually large and strongly curved. On the fore wings the row of spots within that adjacent to the lunules is as well developed as the latter, while the four spots forming the fourth row, usually barely indicated, are large and sagittate with their apices inward. In the middle of the subcostal region of the fore wings is a large hourglass-shaped spot which, were the two red spots present, would fill the space between them. Below the position of the (missing) inner red spot there is on the left wing a white spot, and on the right wing a similar white spot with another below it near the inner margin.

Another specimen (pl. 4, fig. 30) is similar, but the markings on the fore wings within the row of spots adjacent to the lunules are not so heavy, and the hourglass-shaped spot is reduced to a trace of its lower portion. On the hind wings extending downward and slightly outward from the middle of the costal margin there is a row of four small white spots, with another in the lower portion of the cell just above the origin of M_1 and another below the cell just interior to M_1.

One male (pl. 2, figs. 15, 16) has the left fore wing above with the white spots slightly elongated between the veins. In the angles between M_3 and M_2 and M_2 and M_1 there is a thick sprinkling of white scales; between M_1 and SM the lunule is fused with the adjacent spot forming an oblong white patch divided by a hair line of black, and there are two elongated ill-defined spots of white extending from beneath the origin of M_1 nearly to the large outer spot. On the under side all the white markings are much enlarged, though not fused. The markings between M_1 and SM are larger and much more definite than above. The other three wings are normal.

The females are not so variable as the males. The chief variation is in the size and brightness of the white markings which in each individual are more nearly uniform in size than in the males. In the females the white markings are generally rather small, and as their wings are usually somewhat grayish they do not stand out in such sharp contrast as they do in the males. But in some females they are large and brilliantly white and tend to become confluent wherever they approach each other (pl. 5, fig. 35).

In some females (pl. 5, fig. 37) the hind wings show a row of four small white spots extending downward and somewhat outward from the middle of the costal border, with occasionally three more extending from the lower end of this row and at right angles to it to the inner end of the red spot within the anal angle; there are sometimes one or two small white spots in the cell over the large white spots on the under side. On the fore wings the fourth (innermost) row of white spots is sometimes well developed (pl. 5, fig. 34), and there is occasionally a white spot in the inner end of the cell, and one or two beneath the origin of M_1 (pl. 5, fig. 37).

All of these small white spots occasionally appear in northern specimens, though they are not mentioned in any of the published descriptions of the insect.

In one abnormal individual (pl. 3, figs. 17, 18) the upper radial vein in both hind wings terminates halfway from its point of origin to the margin. Beyond its termination the markings of the normally two interspaces are fused. The two marginal red spots have coalesced into one large one, there is a single Σ-shaped lunule, vestigial on the upper side and within it a much enlarged oval white spot.

EUPHYDRYAS PHAËTON PHAËTON, var. SUPERBA Strecker

The variety *superba* of this butterfly appears to recur rather frequently, all of the specimens being very much alike. It is perhaps worth while to give a list of all the recorded captures of this interesting variety. These are the following:

Long Island, New York, 1875; male; Rev. George D. Hulst. The type specimen (Strecker, Butt. and Moths of North America, 1878, p. 125).

East Williamsburgh, just outside the city limits of Brooklyn, New York, June, 1879; Rev. George D. Hulst (Hulst, Bull. Brooklyn Ent. Soc., No. 3, 1880, p. 77).

Webster, New Hampshire, June 12, 1895; W. F. Fiske, (Fiske, Ent. News, vol. 7, March, 1896, p. 87).

Milton, Massachusetts; W. D. Denton; male (Newcombe, Psyche, vol. 14, No. 5, October, 1907, pl. 2, fig. 5, colored).

Milton, Massachusetts; H. H. Newcombe; male; from the same locality as the preceding and like it, but with the white more diffused and less distinct (Newcombe; see preceding reference).

Newtonville, Massachusetts, June, 1897; female; A. H. Clark (Clark, Proc. U. S. Nat. Mus., vol. 45, June 13, 1913, p. 363, pl. 32) (pl. 2, figs. 13, 14).

EUPHYDRYAS PHAËTON SCHAUSI, var. MAGNIFICA, new variety

If the southern form of this butterfly is recognized as distinct from the northern, the southern variety corresponding to the northern *superba* will require a new name. We suggest that it be called variety *magnifica*. We have secured two specimens of this variety, as follows:

Cabin John, Maryland, June 13, 1926; female; A. H. Clark (pl. 2, figs. 9, 10).

Cabin John, Maryland, June 27, 1926; female; A. B. J. Clark (pl. 2, figs. 11, 12). Type, Cat. No. 33131, U.S.N.M.

In the earlier capture (pl. 2, figs. 9, 10) the left wings were of the extreme type, but the right wings were not so much modified. The later capture (pl. 2, figs. 11, 12) was symmetrical.

Season.—The first butterflies were found on the wing on June 11, when 26 were captured in a short space of time, all perfectly fresh and evidently only very recently emerged. None of our pupae had up to this time hatched. On this date the caterpillars seemed to be as abundant as ever, and a mass of eggs was found indicating that this insect begins to lay very shortly after its emergence.

From this time on the butterflies were common; but after the 1st of July the numbers began to decrease, though fresh individuals still represented a large proportion of each catch.

On July 11 an intensive search resulted in the capture of only 3 specimens, 1 male and 2 small females, and none were found after that date.

By a curious coincidence our latest capture in Massachusetts was also on July 11, on which date we took a male at Newtonville. But they are known to fly a little later in the North.

Our observations about Washington indicate that this insect is on the wing for about a month, and this agrees with observations elsewhere.

As fresh individuals are emerging during practically all of the time the butterflies are flying and as very few of the specimens caught are badly damaged the natural inference is that the life of the individual adults is very short; but we have no direct evidence to offer on this point.

Habits.—There is a great difference in the habits of the two sexes of this butterfly, and apparently considerable diversity between different individuals of the same sex. The smaller females (pl. 3, fig. 24) are much more active than the larger ones (pl. 5, figs. 35, 38), and we have frequently found that an individual which we thought was a male proved on capture to be a small female. Similarly the larger males (pl. 4, fig. 25) are less active than the smaller ones (pl. 4, figs. 26, 27).

The large females we have never seen more than about 20 feet away from the food plant, but the small females occur throughout the range of the males. We are inclined to believe that these small females represent a specialized form the function of which is the dissemination of the species.

Both sexes seem to shun the food plant, and the only individuals we have seen upon or even very near it were large females engaged in oviposition.

But while the butterflies show a strong distaste for this plant, preferring to rest on almost any other, especially on grasses, they never voluntarily wander very far from it. They are most common in the grass from 10 to 50 feet from the patches of *Chelone*, and the males and smaller females are frequent up to about 100 feet away. Beyond that distance only rare stragglers are found.

In cloudy weather and on cool days the butterflies are very reluctant to take wing. Under these conditions we have industriously searched for them at the height of the season with the most discouraging results.

On bright hot days, however, the males, especially the smaller ones (pl. 4, figs. 26, 27), are very active. They fly rather swiftly for their size, with rather rapid wing beats and occasional glides after the manner of *Junonia*. Usually they keep near the grass tops, but occasionally they will dart rapidly upward in an erratic zigzag to a height of sometimes as much as 10 or 15 feet, soon coming down and perching on a grass blade. They will often go for a long distance without alighting, sometimes even out of sight. On a hot and sunny day these small males when they take wing are by no means easy butterflies to catch, though when resting they are singularly unsuspicious.

The large females (pl. 5, figs. 35, 38) always are inert, and when started usually fly only a yard or two, and seldom as much as 20 feet They fly only a few inches above the grass tops with a weak and tremulous flight. When resting they are wholly unsuspicious. Once seen, either on the wing or resting, they can invariably be caught.

Oviposition.—Three females were observed in the act of depositing their eggs. In all cases the plant chosen was a very vigorous one well within a dense growth of similar plants which at the time were about 6 inches in height. The more numerous smaller and more scattered plants seemed to be avoided.

The females all selected one of the largest and best developed leaves situated about halfway between the ground and the summit of the plant and extending outward horizontally from the stem. To the under side of this they clung transversely.

During oviposition all three females fanned the air slowly and constantly with their wings. It was the motion of the checkered under side of their wings that attracted attention to them. Had it not been for this they would have been almost invisible, deep down as they were in a mass of dark green foliage through the interstices of which appeared the blackish mud of the swamp.

The habit of this butterfly in crawling deep down into the denser portions of a vigorous colony of the food plant in order to find a suitable place for oviposition is noteworthy.

When engaged in placing their eggs the females are singularly unsuspicious.

All of the egg masses found extended from the midrib nearly or quite to the edge of the leaf, and varied from oval to almost circular in shape. All were incomplete, consisting of a single layer of eggs with sometimes part of a second.

Eggs.—A mass of clear light lemon yellow eggs collected on June 11, and which were probably laid on the same day, went through the various color changes described in detail by Mr. Scudder and hatched on June 27—that is, in 17 days.

Young caterpillars.—To one who is accustomed to gather butterflies mostly by means of a net, this seems to be a rather infrequent species. But in reality it exists in great numbers, although it is very local in its occurrence.

In order to appreciate the abundance of this insect in New England, it is only necessary to search for its food plant toward the middle of August when the conspicuous webs of the caterpillars, now at the summit of the stalks, are at their maximum size. These webs will be found in great profusion wherever the food plant grows.

In eastern Massachusetts we have found them wherever we have found the turtlehead, which here is common. Indeed, in a marshy spot in Prospect Hill Park, in Waltham, dozens of the webs may easily be seen from the road. We have sometimes been surprised to

find how small a colony of plants would support colonies of these caterpillars. The discovery of these very small isolated groups of plants certainly speaks well for the pioneering capabilities of this butterfly.

In a moist hillside south of Otis Street, in Newtonville, there is a small patch of turtlehead which certainly never consists of more than 20 plants. While fairly close together, these are more or less scattered in the long grass. For at least 29 years this little isolated group of plants has supported a colony or two of these insects.

About a hundred yards away down the hill there is another patch of the plants, a little larger. Here also there are always to be found a few colonies of this butterfly. The nearest colonies to these are a mile or more away.

We have often been surprised to find the webs on isolated plants growing by the roadside far from any others.

At the end of August, 1925, we made a search for webs in Essex, as we wished to bring some caterpillars back with us to Washington. But although we found the turtlehead in several places the few webs we found were torn and ragged ones, containing only a very few small and seemingly sickly caterpillars.

The mystery was solved by the eventual discovery of several webs quite different from the usual type of web found on the *Chelone* tops. These webs were small, dense, and opaque, roughly fusiform, and commonly about 4 inches long and an inch or so in thickness. They somewhat distantly suggested a large, loose, and irregular cecropia cocoon. Some were spun about several grass blades, one was on a stem of *Eupatorium purpureum*, and others were on various plants. They all agreed in being low down near the ground in the general mass of herbage and therefore very inconspicuous. Sometimes they were at the base of the *Chelone* stems, but often 2 or 3 feet or more away from the *Chelone* plants. Frequently strands of silk ran between these inhabited webs and the deserted webs on the summits of the stalks of turtlehead. Probably there is always a silken trail at first which, being delicate, soon gets destroyed.

Presumably these were webs especially constructed for hibernation after the caterpillars had finished feeding.

In the locality in Prospect Hill Park, in Waltham, in the previous year we had found the caterpillars prepared for hibernation in the feeding webs, a part of which, usually the lower part, they had thickened considerably. But this does not mean that there were not plenty of small dense webs in the grass or elsewhere which we overlooked.

One of the hibernating webs found at Essex was just below a feeding web to which it was broadly united by great numbers of silk threads,

so that it almost seemed to be part of it. This, therefore, represented a condition intermediate between hibernation in a part of the feeding web and the construction of a distant isolated web.

At Essex the *Chelone* was more or less scattered in rather thick grass nearly as tall as it. At Waltham it was in much larger patches and was taller than the surrounding herbage. It may have been that at Waltham the caterpillars did not have so much temptation to wander off the food plant.

It may be mentioned that the turtlehead is a singularly brittle plant and therefore much less safe a place for hibernating webs than grasses, *Eupatorium*, or the other plants on which we found them. We may also in this connection call attention to the somewhat curious fact that after hibernation the caterpillars will not remain upon the turtlehead except when actively engaged in feeding, and therefore are much more often found on other plants, especially dead leaves and twigs.

We found in the locality in Essex that the hibernating webs always contained caterpillars of very nearly the same size; the smaller and weaker ones apparently were left behind. The number in the webs was never very large, commonly less than 100.

While the feeding webs, large and loose and conspicuously situated at the summit of the *Chelone* stalks, are easy to see, the hibernating webs, much smaller and more compact, built nearer the ground, and usually more or less hidden by the grass, are difficult to find.

On our return to Washington early in September, 1925, we made a search for turtlehead, and found it growing abundantly in a field south of the Conduit Road just 2 miles beyond the Cabin John Bridge. In a moist hollow about midway between the road and the canal there was a large patch roughly 20 feet long and 15 feet broad, the plants in the wetter portion being exceedingly vigorous and close together, those in the drier portion smaller and more scattered. Beyond this moist hollow there runs an old drainage ditch parallel to the road, and all along this ditch are small patches of *Chelone*.

Certain that this insect was to be found here, we made a careful search for it on several different days; but we found not the slightest trace of webs, nor did any of the plants show any evidence of feeding.

Older caterpillars.—In the first week in September, 1925, we brought with us to Washington from Essex, Massachusetts, a number of caterpillars inclosed in a hibernating web.

These were kept outside until February 25, 1926, when they were brought into the house and supplied with succulent shoots of *Lonicera japonica* which had been forced in water. For nearly a week they wandered about without eating; then most of them attacked the plants and began to grow rapidly.

In feeding, the caterpillars always first attacked the terminal buds and then ate downward along the stem. The leaves were scarcely touched until after the first spring molt.

All of the caterpillars molted on March 8 and 9—that is, 11 or 12 days after having been brought from hibernation.

As the caterpillars increased in size they fed with avidity, consuming larger and larger leaves. But one by one they all died off. A single one suspended itself for pupation on April 2, but died without casting its larval skin.

This single northern caterpillar therefore molted once between hibernation and pupation, as described by Mr. Scudder.

On May 10 we visited the locality beyond the Cabin John Bridge, but could find no traces of caterpillars. On May 31, however, caterpillars of various sizes were found in great abundance on all the plants near the large patch of turtlehead, on ferns, grasses, ash, elder, *Viburnum*, willow, cat-tails, etc., but especially on the dead dry leaves and stalks of cat-tails and grasses and the dead last year's stems of various herbaceous plants. One hundred and eleven caterpillars were collected without apparently reducing their numbers.

The caterpillars varied very greatly in size. Many appeared to be fully grown, but a few were scarcely larger than the normal size after the first spring molt. Several were found suspended from a silken button preparatory to pupation; two of these cast the larval skin during the ride home.

The largest caterpillars were placed in four boxes of 25 each. About one-third pupated at once, but nearly all the pupae were at once attacked by the other caterpillars. In one box 10 out of 12 pupae were more or less bitten, usually in the anterior half of the ventral surface, and one was almost completely devoured, only a few empty abdominal segments remaining.

Much to our surprise, the caterpillars which did not pupate molted again. All of the caterpillars brought back were of approximately the same size, and were all, we thought, fully grown, as in the field a number were already suspended for pupation.

All of the butterflies from the caterpillars found suspended in the field as well as from those that pupated in the boxes were males.

We tried feeding the caterpillars on *Wisteria*, which they would not touch, and on *Lonicera japonica*, which they ate, though not with relish. *Chelone* they recognized at once and eagerly devoured.

In the field we have found the caterpillars on the leaves of ash and of *Viburnum* which they had eaten in their characteristic way by cutting in from about the middle of the side.

Our belief is that after hibernation, as well as before, these caterpillars normally feed only on *Chelone*. But they visit this plant only

to feed, after each meal wandering away and seeking any convenient support, preferably dried stalks and leaves of cat-tails and grasses and herbaceous annuals, on which to rest. After resting they retrace the silken thread they always spin wherever they go, wandering down from their supports and back to the *Chelone*. If their thread is broken and they can not find the *Chelone*, they will make a temporary meal of a large number of different kinds of plants. From our observations we believe that normally the turtlehead is their sole food, and other plants are eaten only through necessity.

We have seen large numbers of the caterpillars on the *Chelone*, and have observed that such caterpillars were always busily engaged in feeding. They seem to avoid remaining on this plant longer than is absolutely necessary. They attack mostly the larger leaves, eating inward from about the middle of the edge and thus excavating large rounded sectors. When feeding they are very conspicuous, and they make not the slightest attempt at concealment.

When on the *Chelone* the caterpillars are usually to be found in groups often of as many as a dozen or more. There seems to be no reason why they should concentrate on a few sprigs of the plant out of hundreds growing together. We believe that the apparent sociability of the nearly full-grown caterpillars is merely the result of their following up each others' silken trails if they happen to cross them in returning to the food plant.

The first act of the little caterpillar on leaving the egg is to spin a thread of silk, and all their lives they spin wherever they go. Small caterpillars after hibernation spin an astonishing amount of silk in going back and forth to their food plants, and if they are kept in small containers this has to be constantly cleaned out. This habit of spinning abundant silk is kept up until pupation.

From our observations we are led to believe that at all stages the caterpillars feed at any time of the day or night, provided only that the temperature is sufficiently high. Our small caterpillars in the heated house fed equally at all hours. At any given time, day or night, a few would be feeding and the majority resting as far away as they could get from the food plant. In the field we found the large caterpillars feeding at all times of the day, and the caterpillars we brought home fed ravenously at night.

But at any given time there are always many more caterpillars to be found resting on the surrounding herbage than feeding on the *Chelone*.

This habit probably results in a considerable wastage in caterpillars each year, and probably also accounts to some extent for the very great diversity in size, since not all of the smaller caterpillars are parasitized. It is likely that in many cases the silken trails from the

food plants to the resting places get broken from one cause or another so that many of the caterpillars, unusually active though they are, are unable again to find their normal food.

As has previously been remarked by others the caterpillars are singularly tenacious of life. Some in the last stage which we kept for 30 days without food still were active, though their size was much reduced.

Unlike the caterpillars of many other butterflies, these apparently will not pupate untill the full size is reached.

On June 11 about 100 additional caterpillars were bought in, and more on June 13 and June 20. The butterflies were now flying in abundance, and we noticed that the caterpillars were divisible into two size groups, a larger and a smaller, though there were many intermediates and some dwarfs due probably to lack of sufficient food and to parasitism.

The smaller caterpillars corresponded to those which we had first found which had pupated at once and emerged as male butterflies. The larger caterpillars, which were much larger and stouter, we assumed to correspond to those which instead of pupating had molted. The butterflies from these all proved to be females.

Although we have no conclusive evidence to offer we are strongly inclined to believe that after hibernation male caterpillars molt but once, while female caterpillars molt twice; that is, that male caterpillars molt four times and female caterpillars five times.

It is curious that the female caterpillars are much easier to raise than the males. Though the male caterpillars, like the male butterflies, appear to be much more numerous than the females, most of the butterflies that came through successfully were females.

On June 27 there were still many caterpillars feeding. As only one caterpillar was found suspended and there were very few on the surrounding herbage we thought it probable that the caterpillars still feeding were parasitized, more especially as none were very large.

On July 17 and 18 an exhaustive search was made for the butterflies, without result. The flight seemed to be entirely over for the season.

Four webs of conspicuous size were found which entirely surrounded the upper part of the *Chelone* stalks on which they were constructed. The caterpillars in them, which were busily engaged in enlarging and strengthening them, were still in the first stage, though apparently about ready to enter the second.

No last year's caterpillars were found in the field, but in our boxes in the house a few were still alive, all more or less surrounded by *Apanteles* cocoons.

In this butterfly, therefore, a few of the caterpillars of one year's brood live as caterpillars beyond the entire range of the adult life of

the butterflies of the same brood, and overlap by at least three weeks the caterpillars of the next year's brood. Throughout the entire year this insect is to be found in the caterpillar stage, and for at least three weeks the caterpillars of two successive broods exist together.

On August 3 there were about a dozen webs, which were of all sizes from very small ones 2 to 3 inches long involving only the summit of the *Chelone* and containing caterpillars in the early days of the first stage to very large ones over a foot long involving half a dozen or more plants and the intervening herbage and inhabited by caterpillars of hibernating size. Two of the largest were deserted, the caterpillars having apparently wandered off to form a hibernating web which we were unable to discover.

The very large straggling nests were formed by the coalescence of two, or in one case of three, adjoining nests.

Some of the nests were borne mostly by plants other than *Chelone*. *Eupatorium purpureum*, ferns and grasses were frequently incorporated. But we are sure that in all cases the caterpillars fed only on *Chelone*, though seeming to prefer to rest in that part of the nest supported by other plants.

One nest was found on *Mimulus ringens*, which here commonly grows among the turtlehead. But there was no evidence that the *Mimulus* was being used for food.

On August 7 there were two very small additional webs with very small caterpillars not long hatched. Two of the large webs were in process of being deserted by the caterpillars, which were gathered in a compact mass entirely outside of them below and to one side of their lower ends. The caterpillars were wholly exposed, but rested on a thick flooring of silk which was continuous with the lower end or one side of the web. Evidently these caterpillars were beginning the construction of the hibernating web.

On August 7 the caterpillars were in all stages from the early days of the first stage to the fully fed hibernating stage. Our observations would indicate that the caterpillars feed for about three weeks and then pass into the resting condition. The different egg masses hatch over a period of about a month corresponding to the month that the butterflies are on the wing, and similarly the caterpillars in the different nests enter the resting stage over a period of about a month, from the first to the last of August.

On August 28, after more than a week of showery days, all the webs had disappeared. Of the largest web there were still a few traces left in the form of a few ragged strands of silk with a large amount of frass entangled in it; but these were so inconspicuous that only a close examination revealed their presence. About 2 feet away from the place where this largest web had been there was a fresh hibernating web formed within a leaf of *Sagittaria*, which had been

curled around so that its edges overlapped for half an inch or more, forming a cylinder which had been lined with silk and the ends of which had been closed with silk.

Pupa.—We have searched very carefully for the pupa of this species, but we have never been able to find a single one, though we have found many caterpillars suspended from silken buttons preparatory to pupation. These were mostly on dead cat-tail leaves, dead leaves and stems of grasses, and dead stems of asters and other herbaceous plants.

We believe that the pupae of this butterfly after becoming hardened normally drop from their supports and lie upon the ground until the butterflies emerge. The pupae are weakly attached to the button, and the caterpillars are singularly careless in regard to the supports chosen for pupation. Caterpillars pulled from the button and forced to pupate lying on their side form pupae just as perfect as those which are formed suspended.

The duration of the pupal stage was 10 days for both sexes. A number of female caterpillars which were kept in an incubator at 80° for 4 days beginning just after suspension emerged in 7 days. Others which were placed on ice emerged in 10 days plus the length of time they were on the ice, whatever that was.

Exposure to heat.—Twenty-four female caterpillars ready for pupation were kept in an incubator at a constant temperature of 80° for 4 days. All the pupae formed in the incubator transformed to butterflies. The length of the pupal life was shortened to 7 days from the usual 10.

All the butterflies were perfect and showed no deviation from the normal except that in three the white spots on the upper surface were slightly enlarged and the two outer rows on the primaries tended to become confluent (pl. 5, figs. 34, 35, 38, 39).

Exposure to cold.—Twenty-four female caterpillars ready for pupation were kept at a temperature of 40° for varying periods of time. All the pupae formed transformed to butterflies. The pupal life was in all cases lengthened to 10 days plus the length of time spent in the cold chamber.

About one-quarter of the butterflies had one or more of the wings reduced in size, but there were no other deviations from the normal (pl. 5, figs. 33, 36).

Parasites.—On March 1 a single parasitic larva emerged from one of the caterpillars brought to Washington from Essex, Massachusetts, and formed a cocoon about half an inch away from its victim. This parasite was identified as *Apanteles clisiocampae* by Mr. R. A. Cushman.

On May 31 three dead caterpillars were found on dead cat-tail leaves surrounded by the cocoons of *Apanteles euphydryadis*. All of the cocoons were empty, the parasites having emerged.

On June 15 a number of *Apanteles* larvae emerged from a caterpillar which had been collected on May 31, and between June 22 and 25 larvae in greater or lesser numbers emerged from 15 more caterpillars which had been collected on June 13 and 20. The emergence continued; by June 30 larvae had emerged from 12 more, and by July 18 from 18 additional, making a total of 46 caterpillars out of about 250, about 18 per cent, victims of this parasite.

On June 30 a small tachinid pupa was found in one of the boxes by the side of a caterpillar from which evidently it had just emerged. Mr. Charles T. Greene very kindly identified this for us as *Tachina mella*.

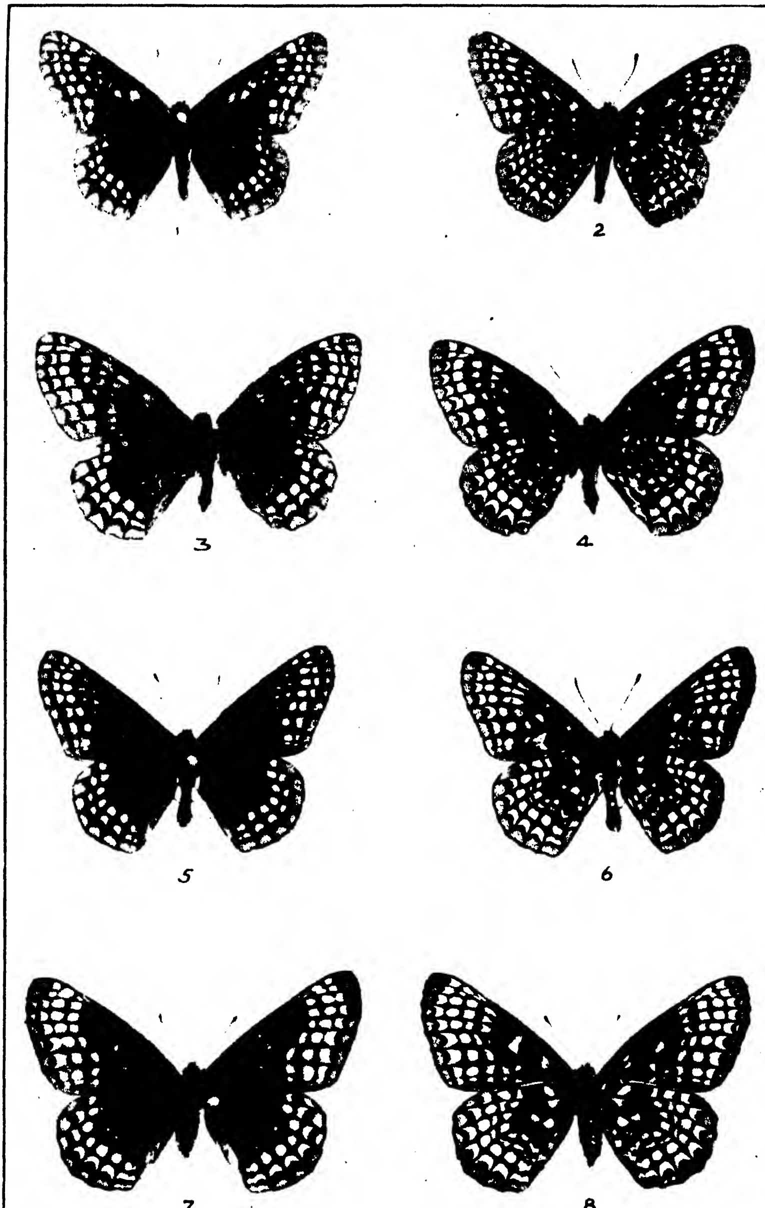
About the middle of July another tachinid larva emerged from a caterpillar. Through the kindness of Dr. John M. Aldrich we are able to say that this was *Phorocera claripennis*.

EXPLANATION OF THE PLATES

Plate 1

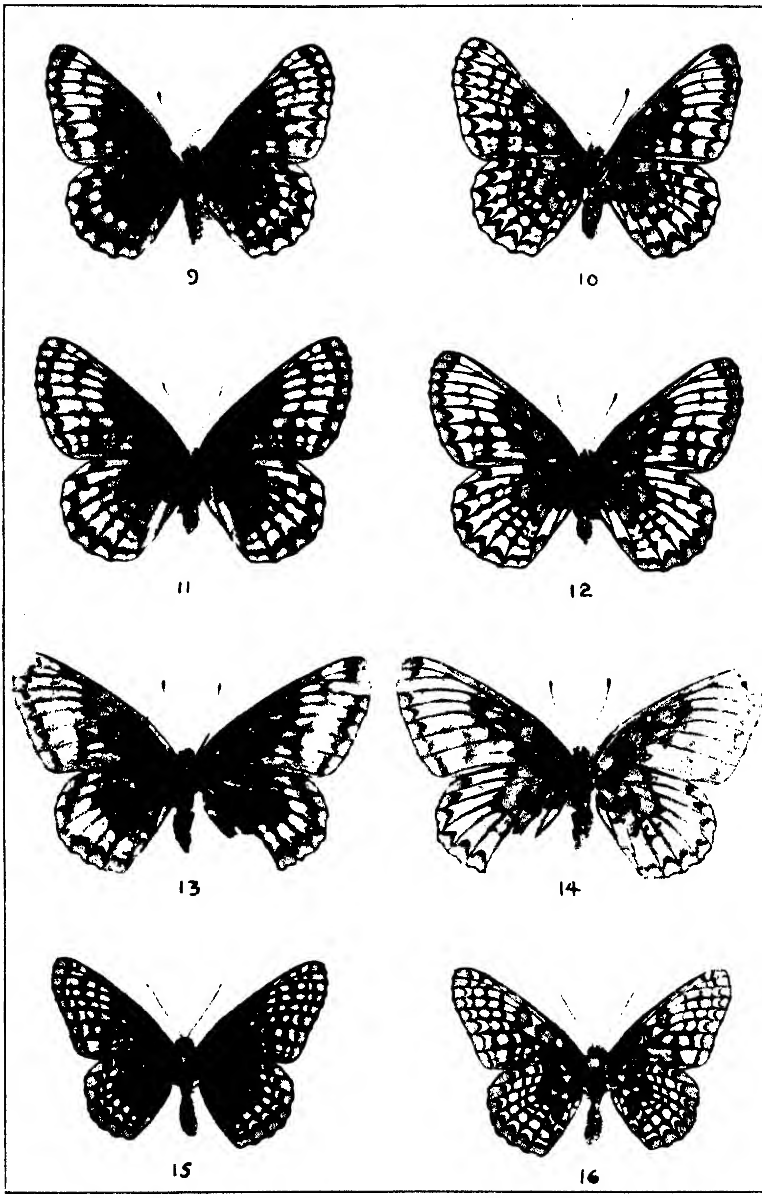
Fig. 1. *Euphydryas phaëton phaëton*, male, Stoneham, Massachusetts, June 27, 1926; C. V. Blackburn.

2. The same specimen, under side.
3. *Euphydryas phaëton phaëton*, female, Weston, Massachusetts, July 9, 1923.
4. The same specimen, under side.
5. *Euphydryas phaëton schausi*, male, type; Cabin John, Maryland, June 13, 1926.
6. The same specimen, under side.
7. *Euphydryas phaëton schausi*, female, type; Cabin John, Maryland, June 22, 1926.
8. The same specimen, under side.



EUPHYDRYAS PHAËTON PHAËTON (FIGS. 1-4) AND EUPHYDRYAS PHAËTON SCHAUSI (FIGS. 5-8)

FOR DESCRIPTION OF PLATE SEE PAGE 18



EUPHYDRYAS PHAËTON SCHAUSI, VAR. MAGNIFICA (FIGS. 9, 12, 15, 16) AND EUPHYDRYAS PHAËTON PHAËTON, VAR. SUPERBA (FIGS. 13, 14)

FOR DESCRIPTION OF PLATE SEE PAGE 19

PLATE 2

FIG. 9. *Euphydryas phaëton schausi*, var. *magnifica*, female; Cabin John, Maryland, June 13, 1926.

10. The same specimen, under side.

11. *Euphydryas phaëton schausi*, var. *magnifica*, female, type; Cabin John, Maryland, June 27, 1926.

12. The same specimen, under side.

13. *Euphydryas phaëton phaëton*, var. *superba*, female, Newtonville, Massachusetts, June, 1897.

14. The same specimen, under side.

15. *Euphydryas phaëton schausi*, male, with the left fore wing approaching the variety *magnifica*; Cabin John, Maryland, June 13, 1926.

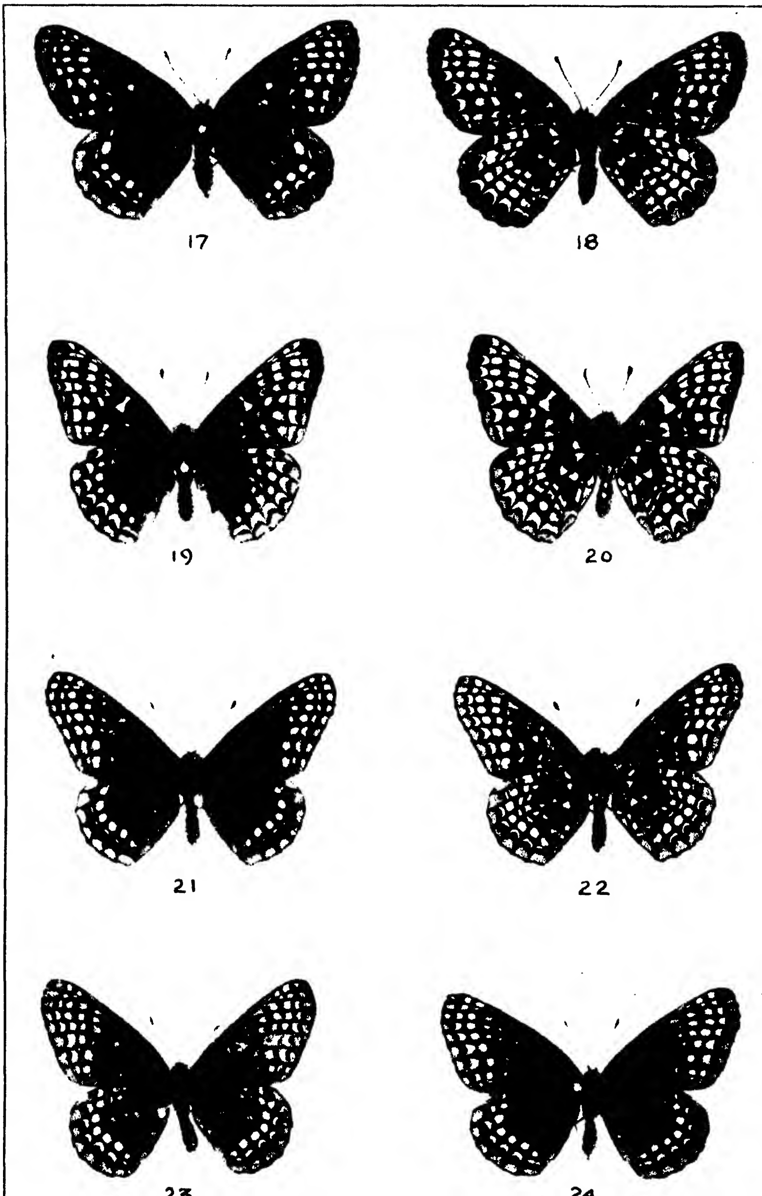
16. The same specimen, under side.

PLATE 3

All the figures represent *Euphydryas phaëton schausi* from Cabin John, Maryland

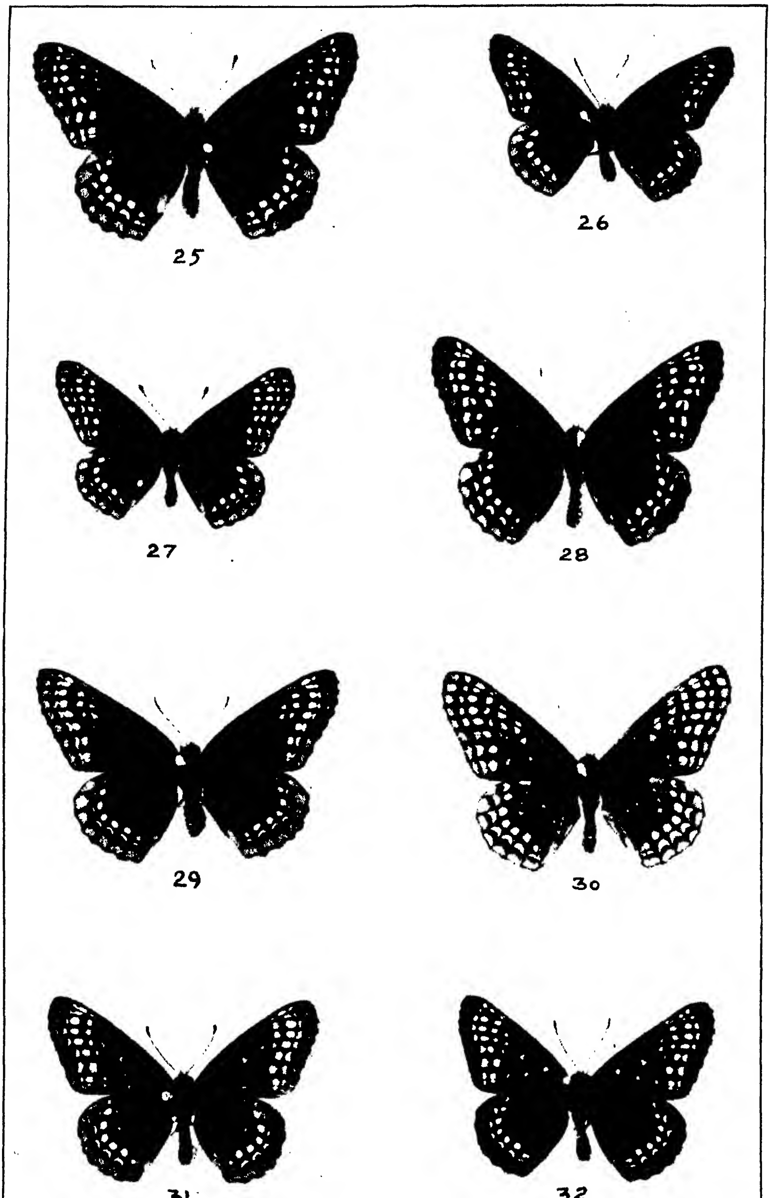
FIG. 17. Female with the upper radial vein in the hind wings only partially developed; June 20, 1926.

18. The same specimen, under side.
19. Male with an unusual development of the white markings; June 24, 1926.
20. The same specimen, under side.
21. Male with the white markings restricted; June 20, 1926.
22. The same specimen, under side.
23. Male with the wings the shape and color of those of the female; July 3, 1926.
24. Small female, for comparison with the preceding.



EUPHYDRYAS PHAËTON SCHAUSI

FOR DESCRIPTION OF PLATE SEE PAGE 20



EUPHYDRYAS PHAËTON SCHAUSI, MALES

FOR DESCRIPTION OF PLATE SEE PAGE 21

PLATE 4

All the figures represent *Euphydryas phaëton schausi* from Cabin John, Maryland

FIG. 25. An unusually fine male; June 20, 1926.

26. An unusually small male, with the white markings much restricted; June 14, 1926.
27. A similar, but lighter colored, male; June 13, 1926.
28. Male; June 20, 1926.
29. Male, showing the typical shape of the male wings; June 27, 1926.
30. Male with an extensive development of white spots in the normally black portions of the wings; June 13, 1926.
31. Male with the hind wings shaped like those of the female (compare with figs. 27 and 29 above); June 13, 1926.
32. Male with the hind wings shaped like those of the female and the left fore wing shortened; June 14, 1926.

Plate 5

All the figures represent *Euphydryas phaëton schausi* from Cabin John, Maryland

Fig. 33. Female which for four days in the early stages of pupation was exposed to a temperature of 40°.

34. Female which for four days in the early stages of pupation was exposed to a temperature of 80°.
35. Female treated as that shown in Figure 34.
36. Female treated as that shown in Figure 33.
37. Female with an unusual development of white spots in the normally black area; June 11, 1926.
38. Female treated as that shown in Figure 34.
39. Female treated as that shown in Figure 34.
40. Female with the fore wings unusually short (see also figs. 9 and 10, pl. 2); June 11, 1926.

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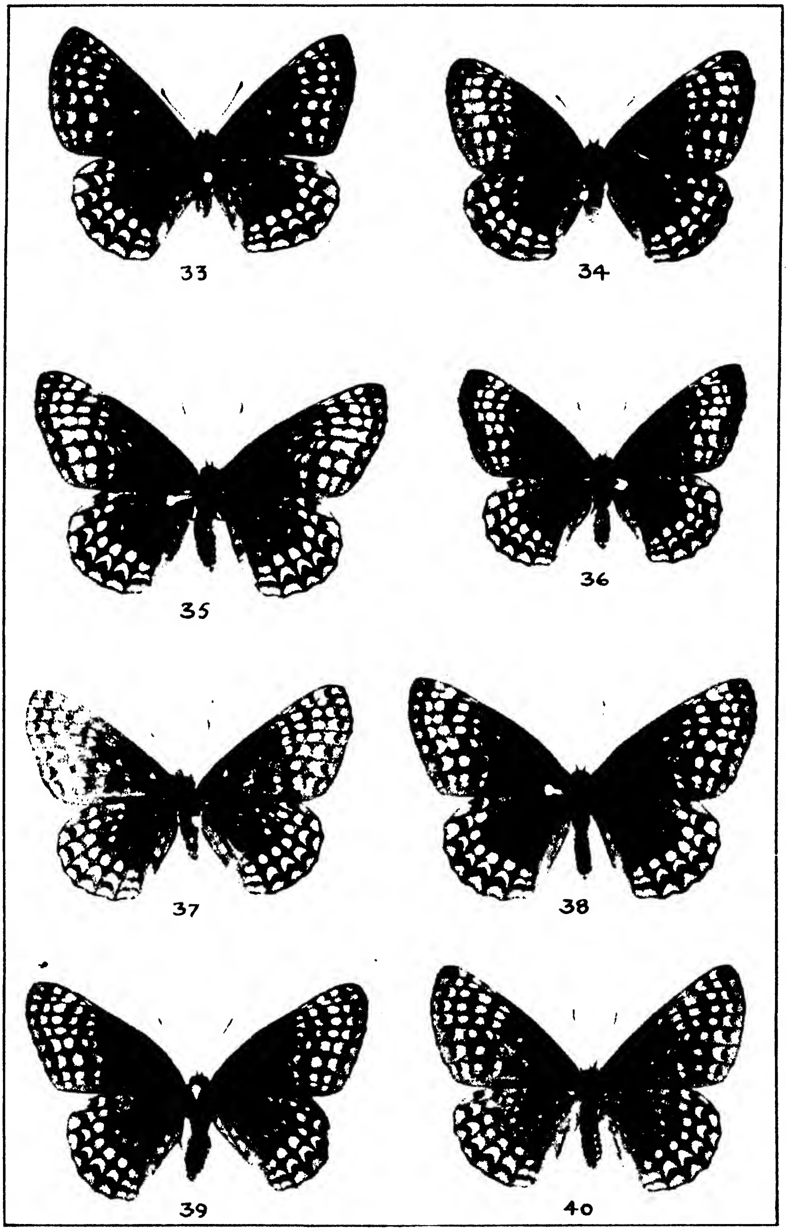

EUPHYDRYAS PHAËTON SCHAUSI, FEMALES

FOR DESCRIPTION OF PLATE SEE PAGE 22

MEGACHILID BEES FROM BOLIVIA COLLECTED BY THE MULFORD BIOLOGICAL EXPEDITION, 1921–22

By T. D. A. Cockerell
Of the University of Colorado, Boulder

At the request of Mr. S. A. Rohwer I have prepared the following report on the bees of the family Megachilidae, obtained by the Mulford Biological Expedition in Bolivia, 1921–22. As might be expected, the collection is rich in novelties; but so far as it consists of known species, they are of the great Amazonian Basin, and in part of Ecuador. Some of the species reach the coast at Guayaquil, but there is no resemblance to the fauna of the dry Pacific slope of Peru.

Genus ANTHIDIUM Fabricius

ANTHIDIUM VARIEGATIPES, new species

Female.—Length about 10.5 mm., anterior wing 8 mm. Robust, black, with light yellow markings, as follows: Mandibles except the sexdentate apex, very broad lower margin of clypeus semicircularly excavated by black above, short lateral marks not reaching level of antennae, four separate stripes along upper margin of head (that is, a narrow band three times interrupted), oblong spot at each side of anterior margin of mesothorax, narrow lateral marginal stripes on mesothorax, large spots on axillae, interrupted band on hind margin of scutellum, short lines on bases of tibiae, and on middle and hind pair another line farther down, narrow bands on abdominal segments 1 to 5, excavated at sides and middle, on first segment interrupted at these points and on second narrowly interrupted in middle, sixth segment with two large transverse patches; anterior femora and tibiae bright ferruginous in front; middle femora red with two black stripes, and their tibiae with a red stripe in front; hind tibiae red with a large median black saddlelike area; venter of abdomen largely red, fifth segment black with a red margin, sixth with a median longitudinal red stripe; hair of face, cheeks, sides of thorax, metathorax, ventral scopa, and legs white; hair of vertex dark fuscous; thorax above with gray hair, black or almost on posterior disk of mesothorax and disk of scutellum; clypeus densely punctured, the middle obtusely elevated and ridgelike; antennae black; mesothorax very densely

granular-punctate; middle of scutellum with shining surface showing between the punctures; tegulae black, with two pale yellow spots; wings dilute fuliginous; basal nervure going basad of nervulus; outer recurrent practically meeting outer intercubitus; tarsi densely covered with white hair on outer side, but with red hair on inner; no pulvilli; abdomen dullish..

Canamina, Bolivia, July (W. M. Mann). Described from one female. Larger than *A. peruvianum* Schrottky, and also known by the variegated legs and broad band on clypeus. Seen from behind, there is a rather strong superficial resemblance to the European *A. diadema* Latreille.

Type.—Cat. No. 29073, U.S.N.M.

Genus DIANTHIDIUM Cockerell

Holmberg in 1903 proposed a subgenus *Anthodioctes*, to contain two new species from Argentina. The name had appeared in print many years earlier, but without definition or described species. Schrottky referred *A. megachiloides* Holmberg (which may be regarded as the type of the subgenus) to *Dianthidium*, but Holmberg did not place such species as *Dianthidium confusum* (Smith) =*jenseni* Friese) and *D. bicoloratum* (Smith) in his new genus. The venation of *Anthodioctes* resembles that of *Dianthidium*, but the proportions of the joints of the labial palpi are rather those of true *Anthidium*. In the labial palpi, *D. chrysurum* agrees rather closely with *A. megachiloides*, the joints measuring in μ about as follows: (1) 960, (2) 545, (3) 95, (4) 103. *D. quadrimaculatum*, which seems to be of the same general alliance, differs rather conspicuously in the labial palpi, the joints measuring about as follows in μ: (1) 370, (2) 320, (3) 95, (4) 88. These measurements were made from the protruding mouth parts without mounting, but are sufficiently accurate for the present purpose. The whole series of Bolivian *Dianthidium* now before me may apparently be referred to *Anthodioctes*, which may be regarded as a subgenus. These bees, with certain species of *Psaenythia* (as *P. collaris* Schrottky and *P. facialis* Gerstaecker) and the wasps of the genus *Nectarinia* appear to constitute a case of Müllerian mimicry. *Nectarinia* is spread over the Neotropical region and gets as far north as San Benito, Tex., where my wife took *N. lecheguana* (Latreille) at flowers of *Koeberlinia spinosa*.

The following key separates the species belonging to or resembling *Anthodioctes*. In the case of several species not seen by me, it is impossible to be sure that they are *Anthodioctes*, since it is possible for *Hypanthidium* (*H. taboganum* Cockerell) to present a superficially similar appearance. *H. beniense*, described below, also resembles this series, and the wings fold longitudinally as in a wasp.[1]

[1] *Anthidium mexicanum* Cresson, of which I have a paratype, is to be called *Hypanthidium mexicanum*

KEY TO SPECIES BELONGING TO, OR RESEMBLING, ANTHODIOCTES

Scutellum entirely black; ventral scopa white or whitish .... 1.
Scutellum all or partly yellow .... 7.

1. Wings fulvous or ferruginous basally, fuliginous or dark apically .... 2.
   Wings not fulvous basally, but usually strongly infuscated, especially in upper part .... 3.
2. 10 mm. long; with fulvous hair; male clypeus with a reversed T in yellow; female face dark, its abdomen with four yellow bands (Brazil) **nectarinioides** (Schrottky).
   7 to 8 mm. long; without fulvous hair; male clypeus orange-yellow; female face dark except obscure lines along orbits, and second segment with no yellow band (Argentina) .... **megachiloides** (Holmberg).
   (*D. portoi nigritulum* Friese might perhaps be sought in this couplet, near to *D. nectarinioides*, but it is smaller, the mandibles with a basal tooth.)
3. Third abdominal segment with only linear lateral spots; smaller than *D. psaenythioides* (7 mm. or a little over, *psaenythioides* 9 mm.) (Paraguay) **vernoniae** Schrottky.
   Third abdominal segment with an orange-yellow band .... 4.
4. Middle of face polished and impunctate .... **manni**, new species.
   Face densely punctured .... 5.
5. Male; clypeus black with a broadly interrupted yellow band on lower margin, sometimes reduced to a pair of small spots .... **mapirense**, new species.
   Female; clypeus entirely black, or (*holmbergi*) very obscurely spotted .... 6.
6. Tegulae black; sixth abdominal tergite with a broad yellow band **holmbergi**, new species.
   Tegulae with a light spot; sixth abdominal tergite with little yellow (Province Salta, Argentina .... **psaenythioides** (Holmberg).
7. Ventral scopa yellow or yellowish (antennae yellow in male *D. buyssoni* the female of which is unknown) .... 8.
   Ventral scopa white (or male only known) .... 10.
8. Scape (female) red beneath; male with margin of clypeus yellow (Brazil; said by Ducke to be identical with *D. lunatum* Smith) .... **duckei** (Friese).
   Scape (female) black, or red only at exteme base .... 9.
9. Abdominal segments 1 and 2 all black (Brazil) .... **albopilosum** (Friese).
   Abdominal segments 1 and 2 with a yellow line on each side (Brazil) **lunatum** (Smith).
10. Very small, about 5 mm. long, or (*D. quadrimaculatum*) somewhat larger .... 11.
    Larger, 7 mm. or over (except *D. indescriptum*, 6.5 mm., but differs from *pygmaeum*, *arenarium*, and *quadrimaculatum* by abdominal segments 1 to 3 all dark) .... 13.
11. Head and thorax less coarsely punctured (Brazil; seen in British Museum, and noted *Dianthidium* venation and pulvilli present) .... **arenarium** (Ducke).
    Head and thorax more coarsely punctured .... 12.
12. Anterior and middle legs of female red (Brazil) .... **pygmaeum** (Friese).
    Anterior and middle legs of female with much black; female with lower part of clypeus not yellow, and scape clear red in front; male clypeus yellow, space between antennae black .... **quadrimaculatum**, new species.
    Male; legs black and yellow; clypeus yellow; two large curved yellow stripes between antennae .... **callorhinum**, new species.
13. Female mandibles with a stout basal tooth; clypeus with a little tooth (Brazil) **portoi** (Friese).
    Female mandibles unarmed at base 14

14. Legs black; females .... 15.
    Legs marked with yellow .... 17.
15. Abdomen with only segments 4 and 5 narrowly margined with pale yellow; wings almost hyaline, with very dark costal margin (Brazil)
    indescriptum (Dalla Torre).
    Segments 4 to 6 with yellow bands; clypeus with only two spots (an interrupted band in *indescriptum*) .... **nitidipes**, new species.
    Segments 3 to 6 with broad yellow bands .... 16.
16. Smaller; mesothorax more finely sculptured; two conspicuous yellow lines on front .... **undecimale**, new species.
    Larger; mesothorax more coarsely sculptured; yellow marks on front much reduced (female) .... **chrysurum**, new species.
17. Head mainly yellow (Venezuela) .... **buyssoni** (Pérez).
    Head black marked with yellow .... 18.
18. Lower half of male clypeus yellow .... **chrysurum**, new species.
    Male clypeus all yellow; female face black (Cayenne) ... **bilineatum** (Spinola).
    Margin of female clypeus and inner orbits broadly yellow
    H. beniense, new species.

DIANTHIDIUM MANNI, new species

Female.—Length about or a little over 9 mm. Robust, black, the head and thorax above with much glistening red hair, sides of face and of thorax with a little white hair; face, mandibles, and antennae black, the flagellum obscurely brownish beneath at base; occiput with an interrupted clay-yellow band; thorax all black, tegulae black; wings dilute fuliginous, with a darker streak in apical part of marginal cell; second recurrent nervure going almost as far beyond second cubital cell as first beyond first intercubitus; abdomen with first segment black, second with a yellow stripe at each side, third to sixth with broad lemon-yellow bands; ventral scopa white; legs black, tarsi hairy, middle tarsi stout; middle of supraclypeal area broadly, and median band on clypeus, narrowing below, polished and impunctate; front densely punctured, vertex shining between the large punctures; mesothorax and scutellum very densely punctured and entirely dull; cheeks shining, with a large raised keel behind; mesopleura coarsely punctured; mesothorax dull, the basal area a biarcuate band; basal abdominal segments very minutely and densely punctured; hind coxae elevated above.

Huachi, Beni, Bolivia, September (W. M. Mann). Described from one female.

Type.—Cat. No. 29074, U.S.N.M.

DIANTHIDIUM HOLMBERGI, new species

Female.—Length, 7.5 mm. Similar to *D. manni* in most respects, but easily distinguished thus: Face densely and coarsely punctured, with a narrow smooth band on supraclypeal area; lower corners of clypeus and inner orbits obscurely marked with reddish (or orange altered by cyanide); flagellum reddish brown beneath; occipital band narrow but entire; cheeks not very broad, coarsely but irregularly

punctured; head and thorax above without red hair, very little hairy; wings dilute reddish fuliginous, nearly uniform; first two abdominal segments coarsely punctured and entirely black (broad orange bands on segments 3 to 6). The ventral scopa is white.

Rurrenabaque, Beni, Bolivia, October (W. M. Mann). Described from one female. Allied to *D. psaenythioides* (Holmberg).

Type.—Cat. No. 29075, U.S.N.M.

DIANTHIDIUM MAPIRENSE, new species

Male.—Length, 5.5 to 6 mm. Black, robust, head and thorax with large punctures, the surface showing between on clypeus and sides of mesothorax; hair of thorax above scanty, whitish; mandibles, tegulae, and entire thorax black; lateral third of lower margin of clypeus (or reduced to spots), narrow stripe up orbits to a little above antennae, a short mark mesad of each antenna, and slender but entire occipital band, light yellow; antennae black; prothorax projecting laterally, so as to appear spiniform seen from above: wings strongly dusky, very dark in the region of the marginal cell; first recurrent nervure not going as far beyond first intercubitus as second beyond second cubital cell; legs entirely black; first two abdominal segments very minutely and densely punctured, entirely black, except a minute dot at extreme sides of second; apex broadly rounded, without teeth; venter banded with white hair.

Type locality.—Near mouth of Rio Mapiri, Bolivia, September (W. M. Mann). Also obtained by the same collector at Huachi, Beni, Bolivia, September, this specimen having the yellow clypeal band more nearly complete. Described from three males. I had to consider whether this could be the male of *D. holmbergi*, but it is much smaller, the wings are very different, and both locality and date are different.

Type and one paratype.—Cat. No. 29076, U.S.N.M.

Paratype in collection of author.

DIANTHIDIUM NITIDIPES, new species

Female.—Length hardly 8 mm. Robust, black, head and thorax strongly and closely punctured; an imperfectly indicated line down the middle of the strongly punctured clypeus; mandibles and tegulae black; small spot at each extreme side of clypeus, narrow stripe along orbits (becoming lines above and ending about halfway up front), curved band mesad of each antenna, and continuous narrow occipital stripe (going nearly to lower end of eyes) all yellow; cheeks very coarsely punctured, keeled behind; antennae dark, third joint red beneath; mesothorax dull, densely punctured, a yellow stripe, not conspicuous, at each side of anterior margin; scutellum and axillae bright orange; area of metathorax longitudinally sulcate in middle, its lower part shining; wings subhyaline; deeply stained with fuscous

in marginal and cubital cells, about basal nervure, and widely on each side of nervulus; first recurrent nervue more distant from first intercubitus than second from second intercubitus; legs black, shining, basitarsi silky with pale hair; abdomen dull, extremely finely and closely punctured, at sides with coarse punctures; first three segments with hind margins obscure reddish, third segment with a small yellow mark at each extreme side; segments 4 to 6 with even entire yellow bands, the first narrow, the others successively broader; ventral scopa white.

Cavinas, Rio Beni, Bolivia, February, 1922 (W. M. Mann). Described from one female.

Type.—Cat. No. 29077, U.S.N.M.

DIANTHIDIUM CALLORHINUM, new species

Male.—Length, 5 to 6 mm. Rather robust, black, with bright lemon-yellow markings; pubescence extremely scanty; head and thorax densely punctured, but shining spaces laterad of the ocelli; mandibles yellow except apex; clypeus, two large curved bars between antennae (shaped something like a tadpole with tail upward), bands along anterior orbits to summit of eye (narrowing above), and rather broad entire occipital band (going halfway down cheeks), all yellow; scape dark, with a yellow stripe in front; third antennal joint with a light spot; flagellum black above, obscure reddish beneath; antennae very much shorter than in *D. quadrimaculatum*, when extended backward reaching about middle of mesothorax; mesothorax dull, lateral third of anterior border and more than half of lateral borders margined with yellow; scutellum and axillae orange, the former sulcate in middle; mesopleura with strong, well-separated punctures, a yellow spot posteriorly; tegulae black; wings dusky, upper part darker but not very dark; second cubital cell more contracted above than in *D. quadrimaculatum;* femora black, knees narrowly ringed with yellow, anterior and middle femora ferruginous in front; anterior tibiae red in front, yellow on outer side, black behind; middle tibiae the same except that the yellow fails basally; hind tibiae black, largely yellow on apical half; tarsi reddish, very pale yellow on outer side; small joints of hind tarsi dark; abdomen finely but distinctly punctured and shining; first segment with a large yellow spot on each side and a pair of obscure dots between; second with a rather narrow yellow band, tbe broad margin beyond brown; third with yellow band much broader and brown margin less; segments 4 to 6 with very broad yellow bands, and apical segment yellow; apex broadly rounded.

Type locality.—Near mouth of Rio Mapiri, Bolivia, September (W. M. Mann). Also from Huachi, Beni, September (Mann). Described from two males. Close to *D. bilineolatum* (Spinola), but that is con-

siderably larger (8 mm.), with different markings on mesothorax, and first abdominal segment without yellow spots.

Type.—Cat. No. 29078, U.S.N.M.

Paratype in collection of author.

DIANTHIDIUM UNDECIMALE, new species

Female.—Length, about 7 mm. Robust, black, with yellow markings; blade of maxilla entirely pale ferruginous; eyes pale lilac-gray; clypeus very strongly and densely punctured, a very small smooth space in middle of upper margin; supraclypeal area with a smooth round median space; front very densely punctured, vertex shining between the punctures, a small smooth space next to each lateral ocellus; cheeks shining, rather sparsely punctured, sharply bounded behind; cheeks much narrower than in *D. manni;* face black, except narrow stripes along the whole length of inner orbits, a little wider above than below; a conspicuous pair of stripes, like a figure 11, between antennae; antennae black, with scape in front and third joint beneath dull red; mesothorax with yellow stripes along lateral third of anterior margin, but not on lateral margins; axillae and scutellum (the latter sulcate in middle) orange; mesothorax dull and excessively densely punctured, with extremely short brown hair, giving a velvety appearance; base of metathorax with a biarcuate groove, crossed by ridges; mesopleura very strongly punctured, the intervals shining; wings dusky gray, darker above basal nervure and in costal region; first recurrent ending more distant from first intercubitus than second from second intercubitus; legs black, tarsi with much pale hair; first two abdominal segments shining, finely and closely punctured (but not so finely and closely as in *D. manni*), hind margin of first rather broadly dull reddish, second with a yellow linear mark at each extreme side; segments 3 to 6 with broad lemon-yellow bands; ventral scopa white.

Near mouth of Rio Mapiri, Bolivia, September (W. M. Mann). Described from one female.

Type.—Cat. No. 29079, U.S.N.M.

DIANTHIDIUM CHRYSURUM, new species

Male (type).—Length, about 7 mm. Robust, black, with yellow markings; head and thorax above with abundant rather long rufous hair; spot on mandibles, very broad band on lower part of clypeus (its upper margin irregular, with a sharp median upward projection), short lines mesad of antennae, lateral face marks (broad below, linear above, ending some distance below top of eye), occipital band (narrowly broken in middle and not extending down cheeks), line at each side of anterior border of mesothorax, lower half of axillae and

scutellum, except base, all yellow; clypeus strongly punctured, with a smooth median line, supraclypeal area with a large smooth space; mesothorax dull and excessively densely punctured; area of metathorax with a biacruate groove, crossed by strong ridges; mesopleura very coarsely punctured; tegulae black; wings strongly dusky, with a dark streak in apical part of marginal cell; first recurrent nervure not quite as remote from first intercubitus as second from second; legs black, middle and hind basitarsi pale yellow on outer side; first two abdominal segments very finely and closely punctured, with large yellow marks at sides, that on second much longer and narrower than that on first; segments 3 to 6 with broad lemon-yellow bands and apical segment yellow; apex broadly rounded, slightly truncate. In one specimen the first abdominal segment is all black and the second has an entire slender yellow band.

Female.—Length, about 8 mm. Face all black, except a small mark mesad of each antenna, and a hardly noticeable line along orbits; supraclypeal area coarsely punctured all over; narrow occipital band extending about halfway down eyes; tarsi black; first abdominal segment all black, second with a slender line on each side; segments 3 to 6 with yellow bands, 4 and 5 brown beyond the band; ventral scopa white. The venation, with the second recurrent nervure going far beyond the second cubital cell, indicates that this rather than *D. undecimale* is the female of *D. chrysurum.* The locality also is the same as that of type *D. chrysurum.*

Huachi, Beni, Bolivia, September (W. M. Mann). Described from five specimens.

Type and two paratypes.—Cat. No. 29080, U.S.N.M.

Two paratypes in author's collection.

DIANTHIDIUM QUADRIMACULATUM, new species

Female (type).—Length, about 6 mm. Rather slender, black, with pale yellow and ferruginous markings; pubescence extremely scanty, dorsum nude, head and dorsum of thorax dull and extremely densely and coarsely punctured, pleura shining between the punctures; eyes pale lilac-gray; clypeus and supraclypeal area densely punctured all over; clypeus with a round reddish-yellow spot at each extreme side; rather broad pale orange bands along anterior orbits, not reaching top of eye; occipital band reddish-yellow, very narrowly interrupted in middle, not going far below top of eye; scape clear ferruginous; flagellum red beneath, dark above, third antennal joint red on both sides; mesothorax dull, more than lateral third of its anterior margin with a yellowish-red band; scutellum and axillae reddish orange, except at base; tubercles with a red spot; a broad, coarsely wrinkled area (not at all biarcuate) at base of metathorax; tegulae clear ferruginous; wings dilute fuliginous, apical margin paler; recurrent

nervures about equally distant from the transverse cubitals; hind legs black, with slightly reddened knees, hair on inner side of basitarsi pale yellowish; anterior and middle femora black, with the apical part largely red; anterior tibiae and tarsi ferruginous, but middle tibiae black behind; abdomen shining, well punctured, with very pale yellow markings, consisting of large spots at sides of first two segments (on first rounded, on second elongate and curved) and entire bands on segments 3 to 5; margin beyond the segments and sixth segment black; ventral scopa white.

Male.—Very similar, but flagellum extremely long, reaching well beyond scutellum; mandibles, clypeus, lateral face marks (broadly dilated and angular mesad below), and markings of thorax lemon yellow; yellow on scutellum only a band, interrupted in middle; anterior and middle tibiae behind with a clear yellow stripe or bar on a black ground; abdomen with four yellow bands, but apex black; apex pointed; venter with white hair. The scape may be dark at base in front and the band on scutellum entire.

Huachi, Beni, Bolivia, September (W. M. Mann). Described from six specimens. Related to *D. gualanense* Cockerell, from Guatemala, but that has the scutellum entirely black.

Type and two paratypes.—Cat. No. 29081, U.S.N.M.

Three paratypes in collection of author.

Genus HYPANTHIDIUM Cockerell

HYPANTHIDIUM BENIENSE, new species

Female.—Length about 7 mm. Robust, black, with clay-yellow markings on head and thorax and lemon yellow on abdomen; hind margins of abdominal segments broadly reddish brown, but base of first and second segments black; mandibles with yellow basal patch; clypeus yellow with two inverted black triangles, touching basally, on upper part; broad lateral bands, reaching to level of middle ocellus; occipital band entire, extending two-thirds way down cheeks; face and front very densely punctured, with no smooth line; cheeks narrow, not distinctly keeled behind; scape light red; flagellum dusky reddish above, clay yellow beneath, pallid, darkened apically; thorax dull and densely punctured, dorsally with short inconspicuous red hair; spot on tubercles, lateral margins and lateral third of anterior margin of mesothorax, continuous band on axillae and hind margin of scutellum yellow; area of metathorax not defined; tegulae large, ferruginous, fuscous in middle; wings fuliginous, very dark above bassal nervure and about end of marginal cell; the wings fold longitudinally after the manner of *Nectarinia;* femora black, anterior ones broadly striped with red apically in front and with a pale yellow stripe behind; middle femora with the same light stripe, but only the

knees narrowly red; anterior and middle tibiae broadly light ferruginous in front, black behind; hind tibiae black with a light yellow stripe at base in front; anterior tarsi ferruginous, the others dark, hind basitarsi with red hair on inner side; abdomen shining, strongly and not very densely punctured; a broad entire yellow band on first segment, large transverse spot on each side of second, and broad bright yellow bands on 3 to 6; ventral scopa dull white.

Cavinas, Beni, Bolivia, January (W. M. Mann). Described from one female. This is quite distinct from the previously described species, being especially known by the entire bands on the abdominal segments except the second, and the marking of the clypeus. There is some affinity with *H. ecuadorium* (Friese), in which, however, the band on first segment is interrupted. There is also some resemblance to *H. flavomarginatum obscurior* Schrottky, which differs by the large yellow spot on the mesopleura, and other conspicuous characters. It has been claimed that *H. guttatum* (Latreille), *H. flavopictum* (Smith), *H. flavomarginatum* (Smith), and *H. elegantulum* (Smith) are all phases of one species, but this seems improbable. It is very probable that *H. elegantulum* and *H. flavopictum*, both from Santarem, are the sexes of one species.

Type.—Cat. No. 29082, U.S.N.M.

The one previously known Bolivian Anthidiine (*Anthidium boliviense* Friese, from Mapiri) is not in the collection. It is a species allied to *A. rubripes* Friese, with black ventral scopa, and red legs and tegulae. Its affinity is with Argentine species to the southward.[2]

The Anthidiines from the Beni Basin, described above, are almost totally unlike those of Peru. Not only do we lack all of the known Peruvian species, but the nine known from that country (*deceptum* Smith, *garleppi* Schrottky, *cuzcoense* Schrottky, *nigerrimum* Schrottky, *peruvianum* Schrottky, *matucanense* Cockerell, *atricaudum* Cockerell, *simulans* Cockerell, and *paitense* Cockerell) are true *Anthidium.* I did not find, nor have others found, any *Dianthidium* or *Hypanthidium.* But as might be expected, the Brazilian Anthidiine fauna much more closely resembles that of the Rio Beni though the recorded species are different. Of the 28 or 29 species and varieties reported from Brazil, 15 are certainly or almost certainly *Dianthidium*, while 6 are *Hypanthidium. Anthidium latum* Schrottky = (*codoense* Ducke) and the introduced *A. manicatum* (Linnaeus) are typical *Anthidium.* The others are more or less uncertain and require more critical examination. The Paraguayan forms (17 species and varieties recorded) are like those of Brazil, in being nearly all *Dianthidium* and *Hypanthidium.* The 24 Argentine forms include species of

[2] Since this was written Friese has published *Anthidium bizonatum* from Oruro. It is a species with black hair and red legs, of the group of *A. philippii* Friese and *A. cuzona* Perez.

Dianthidium and *Hypanthidium*, but also several true *Anthidium*, occurring near the eastern base of the Andes and in Patagonia. *Dianthidium steloides* (Spinola) occurs all the way from Chile to the Province of Buenos Aires in Argentina, according to Holmberg. Ecuador (5 species) has true *Anthidium*, but also a species of *Hypanthidium* (*H. ecuadorium* Friese). Chile (12 species) includes at least some true *Anthidium*, but several of the species are only known to me from descriptions. The Anthidiines of northern South America are few or else not collected; Spinola described two from Cayenne and Pérez one from Caracas, Venezuela.

Genus COELIOXYS Latreille

In contrast with the Anthidiines, four out of five were previously known, two extending to the lowlands of Brazil, two to the coast of Ecuador.

COELIOXYS EXCISA Friese

Female.—Riberalta, Bolivia, January (W. M. Mann). This agrees so closely with the description of *C. excisa* that I can only consider it identical, although the legs, instead of being brown with yellow hair, are mainly black, with knees, tibiae at apex, and posterior femora behind rufous, the tarsi obscurely rufescent, and the hair mainly white, but yellow on inner side of tarsi. Friese records it from Para, Praincha, and Rio Arayollos.

COELIOXYS BILOBATA Friese

Female.—Ivon, Beni, Bolivia, February (W. M. Mann). Friese records it from Tarata, Bolivia; also from Para and Leopoldina.

COELIOXYS SPATULIVENTER, new species

Female.—Length about 9 mm. Black, including mandibles (except a faint reddish spot in middle), antennae, and legs; eyes warm red, with transverse pale crimson stripes; tegulae black, with a large rufous spot; wings fuliginous, with dark stigma and nervures; spurs brown. Hair of eyes so short as to be hardly visible with a lens; face and sides of front densely covered with pale fulvous tomentum, suffused with brown over upper part of face, but long fringe below clypeus warm light ochreous; clypeus so covered as to entirely hide sculpture and margin, but apical margin with three large rounded pits, the intervals between them appearing dentiform under the dense appressed pubescence; flagellum long; cheeks sharply keeled, entirely covered with hair; mesothorax and mesopleura bounded in front and behind with bands of pale fulvous hair, the posterior band on thoracic dorsum broken on each side; mesothorax dullish, with very large sparse punctures; scutellum coarsely and very densely punctured, with a median smooth keel; axillar spines short and broad; mesopleura with

very large punctures; sternal region with white hair; second recurrent nervure joining second cubital cell very near end; legs with white hair, but pale golden on inner side of tarsi; abdomen polished, with fine punctures; hind margins of segments 1 to 5 with linear entire yellowish-white hair bands; sixth segment weakly keeled only on the narrowed apical portion, which is thick and obtuse, not turned upward at end; first ventral segment with white hair in middle and a smooth bare dark red area on each side; segments 2 to 4 with distinct, well-separated punctures, and broad white hair bands; segment 5 greatly prolonged at end, spatuliform, broadly rounded, the broadly truncate end inclined to be emarginate; last ventral segment broad, obtusely pointed, not hairy or notched at side, extending a short distance beyond last dorsal; in profile the end of the abdomen resembles a bird's head, the last dorsal and fifth ventral being the beak, and the last ventral an extended tongue. The under surface of the fifth ventral is weakly keeled and has a gray pruinescence.

Ivon, Beni, Bolivia, February (W. M. Mann). Described from one female. A very distinct species, probably nearest to *C. alatiformis* Friese, but the last dorsal is shaped more as in *C. foersteri* Morawitz, though the basal part is not so broad and the apical is broader. Also, it is not curved downward as in *C. foersteri*.

Type.—Cat. No. 29083, U.S.N.M.

COELIOXYS OCULARIS Friese

Male.—Pongo de Quime, Bolivia, July (W. M. Mann). Remarkable for the exceedingly long brown hair on eyes. It differs from typical *C. ocularis* (from Guayaquil) by the entirely black mandibles and largely black femora, but the species is evidently the same.

COELIOXYS LEUCOCHRYSEA Cockerell

Male.—Reyes, Bolivia, October (W. M. Mann); Covendo, Bolivia, August (W. M. Mann). Compared with typical *C. leucochrysea* from Guayaquil, the upper apical spines of the abdomen are somewhat shorter. From *C. triodonta* Cockerell, also from Guayaquil, it is easily known by the eyes not strongly converging below.

Genus MEGACHILE Latreille

THE SPECIES IN THE COLLECTION MAY BE SEPARATED BY MEANS OF THE FOLLOWING KEY

Females

Ventral scopa black, pure white on first two segments; hind trochanters with a red spot; hair of head and thorax above entirely black ..... **atricoma** Vachal.
Ventral scopa orange ..... **pyrrhotricha** Cockerell.
Ventral scopa pale, if any black only on last segment ..... 1.
Ventral scopa mixed black and light ..... 4.
1. Face densely covered with yellow hair ..... **xantholeuca**, new species.
Face not covered with yellow hair ..... 2.

2. Small species with strongly orange-tinted wings ...... **microsoma** Cockerell.
Much larger; wings not orange ...... 3.
3. Pleura with black hair ...... **hypocrita** Smith.
Pleura with light hair ...... **virescens** Cockerell.
4. Tegulae black ...... **tergina** Vachal.
Tegulae clear red ...... 5.
5. Clypeus convex, ordinary ...... 6.
Clypeus more or less flattened or concave in middle, with a more or less distinct ridge on each side of median area ...... 7.
6. Larger; middle tarsi broad, with clear red hair on outer side; middle tibiae ending in a very broad subtruncate red lobe ...... **mariannae** Dalla Torre.
Smaller; middle tarsi slender; middle tibiae with the apical red lobe emarginate or bidentate ...... **ivonensis**, new species.
7. Larger; wings strongly orange; closely resembles *M. mariannae* except as to clypeus ...... **scapularis** Vachal.
Smaller; wings not orange ...... 8.
8. Supraclypeal area well punctured; eyes red ...... **constructrix** Smith.
Supraclypeal area polished, smooth; eyes not red ...... **lenticula** Vachal.

Males

Legs red ...... 1.
Legs not red, or only in small part red ...... 2.
1. Anterior tarsi modified ...... **polyodonta**, new species.
Anterior tarsi simple ...... **anodonta**, new species.
2. Anterior tarsi modified ...... 3.
Anterior tarsi simple ...... 4.
3. Larger; anterior basitarsus with a long projecting lobe ...... **crassipes** Smith.
Smaller; anterior basitarsus without a projecting lobe ...... **fumicosta** Strand.
4. Hind femora clear light red behind; sixth abdominal segment not emarginate or toothed ...... **lenticula** Vachal.
Hind femora dark red or black behind ...... 5.
5. Sixth abdominal segment emarginate, the margins red; wings suffused with orange ...... **ivonensis**, new species.
Sixth abdominal segment otherwise ...... 6.
6. Sixth segment irregularly multidentate ...... **brasiliensis** Dalla Torre.
Sixth segment otherwise ...... 7.
7. Smaller; sixth segment dentate or emarginate ...... 8.
Larger; sixth segment entire or (*tricosa*) shallowly emarginate ...... 11.
8. Sixth segment with two widely separated sharp teeth ...... 9.
Sixth segment emarginate ...... 10.
9. More robust; tegulae red ...... **microsoma** Cockerell.
Less robust; tegulae black ...... **microdontura**, new species.
10. Face covered with bright yellow hair ...... **beniensis**, new species.
Face without yellow hair ...... **leucostomella**, new species.
11. Face covered with yellow or yellowish hair; tegulae light ferruginous ...... 12.
Face without yellow hair, or else tegulae dark ...... 13.
12. Mesothorax dull and closely punctured all over ...... **lenticula** Vachal.
Mesothorax shining and more sparsely punctured on disk ...... **sejuncta**, new species.
13. Face with orange hair; thorax above without black hair ...... **tricosa**, new species.
Face with hair not orange; thorax above with a good deal of black hair ...... **semota**, new species.

MEGACHILE ATRICOMA Vachal

Female.—Near mouth of Rio Mapiri, Rio Beni, Bolivia, September (W. M. Mann). Vachal's type was from Mapiri, Bolivia. The specimen differs from the description in having the long hair fringing the basin of first abdominal segment pale in middle. The robust hind tibiae are covered on inner face with fine feltlike hair which appears white in certain lights. Margin of clypeus uneven, subdenticulate; flagellum bright ferruginous beneath; upper part of clypeus and supraclypeal area polished, sparsely punctured.

MEGACHILE PYRRHOTRICHA Cockerell

Female.—Near mouth of Rio Mapiri, Rio Beni, Bolivia, September (W. M. Mann). Described from Guayaquil, Ecuador.

MEGACHILE XANTHOLEUCA, new

Female.—Length about 10 mm., anterior wing 8 mm. Black, robust, with broad cordiform abdomen; face and front entirely hidden by long golden-yellow hair; vertex with long black hair, cheeks with long, pure white hair; lower edge of clypeus straight; mandibles black; flagellum long, basal half reddish beneath; fourth antennal joint at least twice as long as third; vertex densely punctured; mesothorax dull and densely punctured, scutellum more shining, but finely and closely punctured; dorsum of thorax with erect black hair, scanty on mesothorax, long on hind part of scutellum; there is also short, thin, whitish hair, and a band of fulvous on each lateral margin, next to the tegulae; pleura and metathorax with dull white hair; tegulae very dark reddish; wings dusky hyaline, darker at apex, stigma and nervures fuscous; legs black, claws red with apex black; hair of legs dull white, pale reddish on inner side of basitarsi; spurs pale reddish; abdomen densely punctured, with only traces of white hair bands at sides, on first segment forming large spots; sixth segment in profile gently concave, with thin, long, dark hair; ventral scopa white, a little black hair at extreme apex.

Cavinas, Rio Beni, Bolivia, January (W. M. Mann). Described from one female. In Schrottky's table of Brazilian species goes near to *M. ventralis* Smith, but is quite distinct; or it could run near the wholly dissimilar *M. bertonii* Schrottky. In Friese's table it falls next to *M. hypocrita* Smith, which is quite different.

Type.—Cat. No. 29084, U.S.N.M.

MEGACHILE MICROSOMA Cockerell

Female.—C. Esperanza, Rio Beni, and Tumupasa, December; *male*, Rurrenabaque, Rio Beni, October. All in Bolivia (W. M. Mann). The female is almost exactly like *M. aurantipennis* Cockerell, from Guatemala, but the mesothorax is not so thickly haired. *M. microsoma* was described from Brazil.

MEGACHILE HYPOCRITA Smith

Female.—Ivon, Beni, Bolivia, February (W. M. Mann). Described from Para.

MEGACHILE VIRESCENS Cockerell

Female.—Espia, Rio Bopi, Bolivia (W. M. Mann). Described from Brazil.

MEGACHILE TERGINA Vachal

Female.—Near mouth of Rio Mapiri, Bolivia, September (W. M. Mann). Described from Huallaga, Peru, and Mapiri, Bolivia.

MEGACHILE MARIANNAE Dalla Torre

Female.—Ivon, Beni, February (W. M. Mann). This is *M. moderata* Smith, the name preoccupied. It was described from Ega, Brazil.[3]

MEGACHILE IVONENSIS, new species

Female (type).—Length about 11.5 mm., anterior wing 9.3 mm. Black, robust, with moderately long but not narrow abdomen; apical portion of mandibles dark rufous; clypeus strongly convex, shining, finely and closely punctured, no smooth line, upper part appearing granular and dull, lower margin abruptly depressed, the edge straight; supraclypeal area shining, with stronger punctures, running in rows, a small, smooth space in middle of apical part; vertex granular from very dense minute punctures; flagellum clear ferruginous beneath, the sutures dark; sides of face and most of front with yellowish white hair; cheeks with thin white hair; at each side of upper part of front is an oblique band of long fulvous hair, these bands meeting at an angle behind anterior ocellus; vertex with pale fulvous hair; mesothorax dullish, closely punctured, scutellum more shining; thorax with yellowish white hair, thin above, more fulvous about region of wings, becoming white below; tegulae bright ferruginous; wings dilute yellowish, the apex dusky; stigma and nervures ferruginous; femora obscurely reddish above; legs with scanty pale hair, dense and pale fulvous on outer side of anterior and middle basitarsi, red on inner side of basitarsi; tarsi rufescent apically; spurs very pale; abdomen shining, finely punctured, the segments with entire narrow cream-colored hair bands; sixth segment gently concave in lateral profile, hoary with fine, pale hair; venter with tegument red at base; ventral scopa mostly white, but very long and conspicuous black hair at sides of segments 4 and 5.

Male.—Length about 11 mm., anterior wing 9.5 mm. Robust, broad, black, with small joints of tarsi yellowish ferruginous; face with pale yellowish or yellowish white hair; long outstanding black

[3] Now called Teffe. For a very good account of this locality, see C. H. T. Towsend, Brazilian American, Nov. 1, 1924.

hairs on clypeus, but it also has recumbent pale hair, apically forming a conspicuous white or yellowish white beard; surface of clypeus finely granular, no smooth line; mandibles black, an obscure red spot at base of outer tooth; vertex dull and finely granular-punctate; flagellum slender, simple, light ferruginous beneath; mesothorax dull, minutely granular-punctate; scutellum convex, shining, with few weak punctures; hair of head and thorax above pale yellowish, fulvous above tegulae (which are clear ferruginous); pleura with long white hair; wings strongly tinged with orange, dusky at apex; anterior coxae with only very short pointed spines, easily overlooked; anterior femora beneath and tibiae in front largely rufous; anterior and middle tibiae with a red spot on outer side at apex; anterior tarsi with a rather short fringe of white hair, middle tarsi with a much longer fringe; hind basitarsi with reddish black hair, on inner side deep red; abdomen shining, with narrow white hair bands, sometimes abraded and lost; keel of sixth segment broadly and deeply emarginate, the borders of the emargination ferruginous; base of venter broadly black in middle, light ferruginous at sides.

Type locality.—Female, Ivon, Beni, Bolivia, February (W. M. Mann); male, Cavinas and Blancaflor, Bolivia, January (W. M. Mann). Distinguished from *M. rubricata* Smith by the dark legs, and from *M. guaranitica* Schrottky by the margin of clypeus not crenulate. It is really allied to *M. leucocentra* Schrottky (which I have from Schrottky), for which it might be taken on superficial examination, but *M. leucocentra* has the abdominal bands much broader and bright yellow, and the middle tarsi, with broad joints, are very different. The male runs in Schrottky's table near *M. exaltata* Smith, but is very different.

Type and one paratype.—Cat. No. 29085, U.S.N.M.

Two paratypes in collection of author.

MEGACHILE SCAPULARIS Vachal

Female.—Ivon, Beni, Bolivia, February (W. M. Mann). Described from Mapiri, Bolivia and (male) Pachitea, Peru. I will designate the female from Mapiri as the type. This is closely allied to *M. mariannae,* showing that the peculiar facial structure must have arisen in this immediate group, and apparently indicating that other species more or less similarly formed are not necessarily closely related. It seems to me that this female must belong with *M. crassipes* Smith, owing to the very close general resemblance, the black hair at base of clypeus, and the first recurrent nervure nearer first intercubitus than in *M. mariannae.* Vachal's description of the male also agrees well with my identification of *M. crassipes;* a point to be added is that the second joint of middle tarsus has a little tooth on inner side. *M. crassipes* was described from Sao Paulo on the Amazon.

MEGACHILE CRASSIPES Smith

Male.—Tumupasa, Bolivia, December (W. M. Mann). As mentioned above, I believe this to be the male of *M. scapularis*, and if this is confirmed, Smith's name has many years' priority.

MEGACHILE CONSTRUCTRIX Smith

Female.—Ivon, Beni, Bolivia, February (W. M. Mann). Described from Villa Nova, Brazil. *M. fumicosta* Strand is related, or at all events superficially similar, but surely not its male, the wings being so much darker.

MEGACHILE LENTICULA Vachal

Female, male.—Riberalta, January; males Cavinas, Rio Beni, and Blancaflor, Beni, January. All in Bolivia (W. M. Mann). I have specimens from Brazil, but Vachal described it from Mapiri, Bolivia.

In a series the legs of the male will vary from black to red. A description of the male is given here as none is available in English.

Male.—Length about 11 mm. Rather robust, black, including mandibles, antennae, and legs, but tegulae clear ferruginous; head broad, eyes reddish, face and front densely covered with long tawny-yellow hair; upper part of clypeus with a shining space; cheeks with long dull white hair below; vertex with thin pale hair and some dark hairs intermixed; mesothorax dullish, with very close shallow punctures; scutellum more shining; thorax above with very sparse whitish hair, long black hairs on posterior part of scutellum; sides of thorax with abundant long pale fulvous hair, becoming dull white below; posterior face of metathorax shining; wings dusky hyaline, darker apically, nervures and stigma dark; recurrent nervures ending very near base and apex of second cubital cell; anterior coxae without spines; anterior tarsi simple, except that both anterior and middle tarsi are fringed behind with long dull white hair; abdomen dullish, with broadly interrupted white hair bands; keel of sixth segment entire, subtruncate; venter black, with white hair bands.

In Schrottky's table runs to *M. urbana* Smith, but differs by the dark anterior tarsi and other characters.

MEGACHILE FUMICOSTA Strand

Male.—Huachi, Beni, Bolivia, September (W. M. Mann). According to Schrottky's label on a specimen received from him, *M. vernoniae* Schrottky is a synonym. My specimens are from Puerto Bertoni, Alto Parana.

MEGACHILE BRASILIENSIS Dalla Torre

Male.—Cavinas, January, and Ivon, February, Rio Beni, Bolivia (W. M. Mann). This is *M. denticulata* Smith (name preoccupied), from Rio Tapajos, Brazil.

MEGACHILE POLYODONTA, new species

Male.—Length about 8.5 mm. Slender and parallel-sided, black, with the femora, tibiae, and tarsi bright ferruginous; face and front covered with long pale yellow hair; eyes pale red; mandibles black; cheeks with long white hair; vertex nearly bare, broad, closely punctured; mesothorax and scutellum shining, with weak delicate punctures; area of metathorax dull; flagellum long, entirely dark, with the faintest brown tinge beneath; hair of sides of thorax long and white; dorsum with extremely thin erect black hair, longest on scutellum; tegulae shining ferruginous; anterior wings with upper part fuliginous, lower part dusky hyaline, stigma and nervures dark; anterior coxae with short stout dark spines, rather easily overlooked; anterior tarsi with first three joints broad, yellowish white, without any projecting process, the hind margin with a long white fringe, and the usual black spot on inner surface; middle basitarsi with a long white fringe behind, and part of this fringe on the apex of tibia; abdomen highly polished; a deep sulcus at base of second and third segments; segments 1 to 5 with white hair bands, broadly failing in middle; segment 6 directed downward, the margin of the transverse keel jagged, with five or six irregular teeth; nearly all of venter shining light ferruginous, with two white hair bands. The middle joints of hind tarsi are black.

Huachi, Beni, Bolivia, September (W. M. Mann). Described from two males. In Schrottky's table falls near *M. lobitarsis* Smith, but is not similar.

Type.—Cat. No. 29086, U.S.N.M.

Paratype in collection of author.

MEGACHILE ANODONTA, new species

Male.—Superficially just like *M. polyodonta*, with the same size, slender form, red legs, yellow hair on face, etc., but quite distinct by the following characters: Subapical region of mandibles broadly red; mesothorax and scutellum more distinctly punctured; a band of yellowish hair in scutello-mesothoracic suture; wings not so dark; anterior coxae not spined; anterior tarsi simple; anterior and middle femora larger, more expanded; extreme bases of abdominal segments 2 to 4 rufescent; keel of sixth segment red, broadly rounded, entire, not denticulate; red of venter stained with blackish in middle.

Reyes, Bolivia, October (W. M. Mann). Described from one male. The close resemblance to *M. polyodonta* surely indicates affinity; hence a grouping of species by the character of the front legs would be artificial, the legs being apparently independently modified in different series. In Schrottky's table this falls near *M. giraffa* Schrottky, which has a much broader abdomen.

Type.—Cat. No. 29094, U.S.N.M.

MEGACHILE MICRODONTURA, n. sp.

Male.—Length, 7.3 mm. Black, slender, width of abdomen slightly over 2 mm.; mandibles, eyes, antennae, tegulae, and legs black; eyes converging below; clypeus convex, finely punctured, the lower margin with a long dense creamy white fringe; cheeks broad, sharply keeled behind, little hairy, except beneath, where there is abundant long pure white hair; front completely dull, vertex shining, with distinct punctures; top of head with some erect dark hairs; mesothorax shining in front, dull behind, minutely punctured; scutellum finely punctured; metathorax obliquely sloping, shining; dorsum of thorax anteriorly with yellowish pile, changeable in various lights, but scutellum posteriorly with erect black hair; wings dusky, the middle clear, stigma and nervures dark brown; anterior coxae unarmed, anterior tarsi simple; tarsi with white hair; abdomen rather long and narrow, minutely granular, basin of first segment deep, polished, apex of first segment with pale fulvous hair, third and fourth segments with tegument rufous at base; apex of fourth and fifth segments, and whole of sixth, covered with golden pile; keel of sixth segment with two rather short sharp black teeth; venter with much creamy white hair.

Rurrenabaque, Bolivia, October (W. M. Mann). Described from one male. Allied to *M. microsoma* Cockerell, but more slender, with black tegulae. It is also allied to *M. bertonii* Schrottky to which it runs in Schrottky's table, and *M. xanthura* Spinola, to which it runs in Friese's table.

Type.—Cat. No. 29087, U.S.N.M.

MEGACHILE BENIENSIS, new species

Male.—Length 8 mm. Rather broad, black, with light rose-red eyes; face densely covered with long yellow hair; mandibles and antennae black; flagellum long simple; cheeks with white hairs; vertex shining, finely punctured, with long black hair; mesothorax dull, extremely finely and closely punctured, scutellum about the same; hair of thorax above thin, on mesothorax white and black, on scutellum black, longer and denser; other parts of thorax with white hair, and a conspicuous white band in scutello-mesothoracic suture; tegulae extremely dark brown; wings hyaline, dusky at apex, nervures and stigma brown; legs black, the anterior femora with a large reddish clay-colored patch on apical half within, extending also to lower margin, and the hind tibiae with a pale reddish stripe on outer side; hair of legs white, spurs pale; anterior coxae with long slender spines, anterior tarsi simple; abdomen short, moderately shining, finely and closely punctured; pale ochreous hair bands on segments 1 to 4, thin or interrupted in middle; on 1 developed only at sides; fifth segment covered with creamy or pale ochreous hair, with small black hairs

interspersed; sixth densely covered with ochreous hair; keel of sixth segment produced, broadly emarginate, with two salient angles; venter black.

Huachi, Beni, Bolivia, September (W. M. Mann). Described from one male. In Schrottky's key runs to *M.* (*denticulata* Smith) *brasiliensis* Dalla Torre, but is not that species, which is also in the collection.

Type.—Cat. No. 29088, U.S.N.M.

MEGACHILE LEUCOSTOMELLA, new species

Male.—Length about 7 mm. Black, broad, the wings dusky (not at all orange), becoming dark fuliginous in costal region, including marginal cell; clypeus convex, polished, with well-separated punctures, bare, the lower margin with a long pure white fringe; cheeks with a sharp elevated margin posteriorly; a large tuft of pure white hair behind each mandible; mandibles, antennae, and tegulae black; vertex dull and very densely punctured, more sparsely at sides; mesothorax dull, with silky pale ochreous hair, changeable in different lights; anterior coxae without spines; anterior femora with a reddish clay stripe on inner face; anterior tarsi simple; the tarsi outwardly hoary with white hair; abdomen dull (except polished basin of first segment), the hind margins of segments more shining; hind margin of third segment with rudiment of ochreous band at each extreme side, fourth with a very thin hardly evident band, fifth with a distinct narrow band, sixth densely covered with ochreous hair; keel of sixth emarginate, with two salient rather obtuse angles; venter with four conspicuous broad hair bands, the first white and not reaching sides, the others pale yellowish, extending right across.

Huachi, Beni, Bolivia, September (W. M. Mann). Described from three males. Closely related to *M. bertonii* Schrottky, but that has a broader face, fringe on clypeus not white, tegulae largely red, etc.

Type.—Cat. No. 29089, U.S.N.M.

Two paratypes in collection of author.

MEGACHILE SEJUNCTA, new species

Male.—Length about 9.5 mm., anterior wing 7.5 mm. Black, rather robust, with short abdomen; mandibles, legs, and the long antennae black, but tegulae shining ferruginous; sides of face, supraclypeal region, and most of front covered with long pale yellowish hair and lower part of clypeus with a long dense fringe of the same; the rest of clypeus bare, with thin overlapping hairs, densely punctured at sides, but with a median broad, smooth, and polished band; cheeks beneath with dull white hair; vertex well punctured but shining, some black hair about the ocelli; mesothorax polished, with well-separated punctures; scutellum convex, shining; mesopleura

coarsely punctured; hair of thorax above scanty, pale in front and in scutello-mesothoracic suture, a little black on mesothorax, and more on scutellum; sides of thorax with dull white, faintly yellowish hair; anterior coxae without spines; anterior tarsi simple, with only a short fringe behind; anterior femora and tibiae red beneath; middle and hind femora reddish black, their tibiae with an obscure red spot at end; middle tarsi with only a short fringe (contrasting with the very long fringe of *M. lenticula*); spurs very pale; wings brownish, darker apically, dilute fuliginous in marginal cell and beyond; stigma and nervures dark; abdomen short and broad, shining, with white hair bands at sides of segments only, that on fifth segment thinly continuous; keel of sixth segment entire, hardly produced, not truncate; first ventral segment with a broad stramineous margin.

Cavinas, Beni, Bolivia, January (W. M. Mann). Described from two males. Also runs to *M. urbana* Smith in Schrottky's table, but is quite distinct. Another from Huachi, Beni, has darker tegulae.

Type.—Cat. No. 29091, U.S.N.M.

Paratype in collection of author.

MEGACHILE TRICOSA, new species

Male.—Length about 9 mm. Black, robust, with rather short abdomen; hair of head and thorax pale fulvous, very scanty on thorax above and with no black on scutellum; eyes pale brownish, blackened in front; mandibles and antennae black; tegulae and legs black with a more or less reddish tint; anterior femora and tibiae, and middle femora largely, red beneath; face with orange-fulvous hair, not very bright, clypeus exposed except lower margin, shining but rather closely punctured, with no median smooth line; vertex shining but well punctured, its hair fulvous, very thin; mesothorax with smaller, dense punctures, but shining between them; scutellum with very small and dense punctures; anterior coxae with short spines, anterior tarsi simple; fringes of anterior and middle tarsi short; hind basitarsi with pale orange hair on inner side; wings dusky, dilute fuliginous in marginal cell and beyond; nervures and stigma dark; abdomen dullish, excessively minutely and closely punctured, reddish black, hind edge of first segment shining; a little pale ochreous hair at sides of segments 2 and 3, an entire thin band on margin of 4, and also a thin band in the transverse sulcus; fifth and sixth segments covered with dull pale ochreous hair; keel of sixth segment shining, shallowly emarginate in middle, without salient angles or teeth; first ventral segment with a broad hyaline margin.

Tumupasa, Bolivia, December (W. M. Mann). Described from one specimen. Falls in Schrottky's table as near to *M. bertonii* Schrottky as anything, and really is somewhat allied. It could also be run near *M. hilaris* Smith, but is not allied.

Type.—Cat. No. 29092, U.S.N.M.

MEGACHILE SEMOTA, new species

Male.—Length 9 to 10 mm. Robust, shining black, with short abdomen; eyes pale pinkish gray; mandibles black; flagellum dull red beneath, the sutures darker; tegulae dark red with a black semicircle; legs black, with anterior femora red beneath, and middle ones obscurely so; abdomen reddened at each side basally; hair of face and front white, with an admixture of black, most of clypeus and supraclypeal area exposed; clypeus shining, densely punctured, but with a broad, smooth median line, and a subapical pit; supraclypeal area well punctured but shining; cheeks with white hair, but on under side of head, below mandibles, it is reddish fuscous; cheeks broad, sharply keeled behind; vertex broad, shining, closely punctured, with thin black hair, smooth areas next to the ocelli; mesothorax and scutellum shining, with strong, well-separated punctures; mesothorax almost hairless, but scutellum with much black or dark fuscous hair; other parts of thorax with partly pale and partly reddish sooty or fuscous hair; anterior coxae with small protuberances, hardly spines; anterior tarsi simple, the basitarus with a black fringe behind; ends of tarsi obscurely rufescent; abdomen short and broad, shining, with fine punctures, white hair bands reduced to rudiments at sides, but entire band on fifth segment, and surface of sixth, with gray hair; keel of sixth broadly rounded, entire.

Type from Huachi, Beni, Bolivia, September (W. M. Mann). Also from near mouth of Rio Mapiri, September (W. M. Mann). Described from four males. In Schrottky's table runs nearest to *M. lamnula* Vachal, which has red legs.

Type and one paratype.—Cat. No. 29093, U.S.N.M.

Two paratypes in author's collection.

O

A REVISION OF THE COTTOID FISHES OF THE GENUS ARTEDIELLUS

By Peter Schmidt

Of the Zoological Museum, Academy of Sciences, Leningrad, U. S. S. R.

During the last 20 years there were described by different authors, American and Russian, many Pacific species of the genus *Artediellus* Jordan, a group in which species are very difficult to distinguish. It would perhaps not be superfluous to give a revision of this genus from the large collection of the zoological museum of the Russian Academy of Sciences in Leningrad, where all known species of this genus, Pacific and Atlantic, are now represented by many specimens and from different localities. Especially valuable is the collection of the Hydrographical Expedition of the Pacific Ocean made during the years 1908–1920 by many cruises of the steamship *Okhotsk* and other vessels of the Russian Navy, working on the survey of the coasts along Bering, Okhotsk, and the North Japanese Seas. From a study of the Cottidae of this collection and comparing these specimens with those of other collections of the museum, I am able to present the following short revision of the genus *Artediellus* Jordan. A more detailed study will be published later in the Russian language.

Family COTTIDAE

Genus ARTEDIELLUS Jordan

Teeth on vomer and palatines. Upper praeopercular spine strongly curved and hooked upward, sometimes with a small denticle. No slit behind last gill. Gill membranes forming a broad fold across the isthmus. Skin naked and smooth or partly covered by cutaneous prickles. No developed anal papilla.

ANALYSIS OF SPECIES OF ARTEDIELLUS

a^1. Skin completely naked and smooth.

b^1. Nasal spines obsolete; skin soft and smooth, loosely attached to the body; pores on upper sides of head few and inconspicuous. miacanthus.

b^2. Nasal spines present.

c^1. Occiput without bony tubercles, slightly concave.

d^1. Lateral line with 22 to 26 pores; maxillary barbel sometimes branched ---------- **pacificus.**

d^2. Lateral line with more than 26 pores.

e^1. Lateral line with 27 to 33 pores; maxillary barbel always simple; a round black spot on front of dorsal in male. **ochotensis.**

e^2. Lateral line with 31 to 34 pores; cirri on head reduced; no round black spot on front of dorsal in male. **(ochotensis) camchaticus.**

c^2. Occiput with bony tubercles.

d^1. Bony tubercles on occiput, round, directed upward.

d^2. Bony tubercles on occiput, elongate, triangular in shape, spine-like or ridge-like, directed backward.

e^1. Bony tubercles on occiput two in number ---------- **dydymovi.**

e^2. Bony tubercles on occiput four ---------- **schmidti.**

f^1. Lateral line with 27 to 30 pores; cross bands on dorsal fin of male formed by row of round white spots. **uncinatus.**

f^2. Lateral line with 20 to 23 pores; white cross bands on dorsal fin of male continuous ---------- **europaeus.**

a^2. Skin more or less beset with cutaneous prickles.

b^1. Prickles on head, occiput back and over lateral line; cirri almost completely absent ---------- **scaber.**

b^2. Prickles on head, occiput and below the first dorsal; cirri well developed, present in two rows upon first third of lateral line. **(scaber) beringianus.**

ARTEDIELLUS PACIFICUS Gilbert (1893)

D. VII–VIII, 12–13; *A.* 11–12; *P.* 22–24; *V.* I, 3; *L. lat.* 22–26.

This first described Pacific species differs chiefly from all the Atlantic and Arctic species known by the absence of the blunt bony protuberances on the occiput, and from other Pacific species described later by the smaller number of pores of the lateral line. This number varies according to Gilbert and Jordan and Evermann[1] from 22 to 26 pores and is more often 24 pores. Our single specimen (Russian Academy of Science No. 13695 from the United States National Museum Cat. No. 48657, *Albatross* station 3279, 56° 25′ N., 162° 39′ W.) has 25 pores. The number of pores on the top of the head is small and the pores are inconspicuous. The cutaneous cirri in our specimen are not much developed and the maxillary barbel is short and simple. According to American authors this barbel is sometimes large and compound, furnished with 1–4 short lateral branches. This seems never to occur in other Pacific species.

Geographical distribution.—This species seems to be confined to the eastern part of the North Pacific. It is found on the coasts of

[1] Bull. U. S. Nat. Mus., No. 47, Fish. North and Middle Amer., pt. 2, 1898, p. 1906.

Alaska, in Bristol Bay, south of Sannak Island, north of Unalaska, and off St. Paul Island. According to Gilbert[2] it was found also off Povorotnaya (Cape Povorotny on the east coast of Kamchatka) in 100 and 96 fathoms, but this must be revised, as probably the specimens from these localities belong to other later described species, especially as Gilbert says, that "some of these specimens * * * show the head with more pores than could be distinguished in the type."[3]

ARTEDIELLUS OCHOTENSIS Gilbert and Burke (1912)

D. VII–VIII, 12–14; *A.* 12–13; *P.* 21–23; *L. lat.* 27–33.

This species is closely allied to the eastern form *Artediellus pacificus* Gilbert, but differs chiefly in having more pores in the lateral line. In our large collection (71 specimen) the variation of the number of pores is as follows:

Pores	27	28	29	30	31	32	33
Specimens	3	26	19	12	8	3	0

No specimen in our collection has fewer than 27 pores, and, therefore, this species must not be regarded as a subspecies of *A. pacificus* Gilbert.

Artediellus ochotensis has also well-developed and conspicuous pores on the top of the head and on the occiput and many well-developed cirri. There are occipital and supraorbital cirri, one cirrus on the praeoperculum, one on the operculum, and a row of 3–5 cirri between the occiput and the third or fourth pore of the lateral line.

The coloration of this species is also very typical. On the first dorsal of the male there is nearly always a round black spot on the hinder edge. The dark crossbands on the dorsal, pectoral, and caudal fins are very conspicuous.

The length of the body of the full-grown specimens is 70–80 mm., but some of our specimens have the length of 102.2 mm.

Geographical distribution.—This species is widely distributed in the western part of the North Pacific. In the Bering Sea it is recorded from St. Paul Bay (61° 8′ N., 172° 7′ E.), Archamton Bay (59° 27′ N., 158° 7′ E.), Karaginskaya Guba (58° 50′ N., 168° 13′ E.), from Avatcha Bay, and from some other points of the east coast of Kamchatka. In the Okhotsk Sea it is found in the northern part of the sea (Tauiskaya Guba, Erineiskaya Guba, Shantarsky Islands); on the west coast of Kamchatka (52° 38′ N., 155° 40′ E.); and off Sakhalin in Terpenya Bay, in Shamoff Bay,

[2] Fish. Bering Sea, 1899, p. 454.

[3] Attention is called to the fact that Gilbert and Burke, in describing *A. ochotensis*, expressly stated (Bull. Bur. Fish., vol. 30, 1912, p. 46) that the Robben Island, Okhotsk Sea, specimens had been confused with *A. pacificus*.—L. S.

off Cap Notoro, off Cap Seniavino. In the North Japanese Sea it is found in the Tartar Straits, in De Castries Bay, in 51° 26.5′ N., 141° 29.5′ E., in 50° 58′ N., 141° 4′ E., and off Moneron Island (Todomosiri near Laperouse Strait).

ARTEDIELLUS OCHOTENSIS morpha CAMCHATICUS Gilbert and Burke (1912)

Artediellus camchaticus GILBERT and BURKE, Bull. Bur. Fish., vol. 30, 1910, (1912) p. 46, fig. 6.

This form is nearly allied to *Artediellus ochotensis* Gilbert and Burke and can not be separated, either as a distinct species nor as a subspecies.

The variation of the number of pores in the lateral line is nearly the same, as is shown by the following figures:

Pores	28	29	30	31	32	33	34
Specimens	3	5	3	2	2	0	1

The difference lies principally in the lower development of the cutaneous cirri and of the pores on the top of the head and on the occiput. But both these features are also highly variable in *A. ochotensis* Gilbert and Burke, so that one can not trace a distinct line between these two forms. The coloration is also very variable in both forms; but in *A. ochotensis* morpha *camchaticus* the crossbars on the dorsals, pectorals, and caudal fins are not so continuous and are formed mostly by separate brown spots. No distinct black round spot on the upper part of the first dorsal is seen, but sometimes a dark blotch.

This form can not be regarded as a subspecies of *Artediellus ochotensis* Gilbert, as it has not a separate geographical range. Such forms connected with the typical species by continuous variation and having the same geographical distribution as this species, I regard, as do many Russian entomologists, ornithologists, and ichthyologists[4] as *morphae* (forms).

Geographical distribution.—The *Albatross* dredged this form at stations 4794, 4795, and 4796, off Avatcha Bay, Kamchatka. According to our collectors it is widely distributed in Okhotsk Sea and found in its northern part (59° 15′ N., 144° 15′ 5″ E.), off the west coast of Kamchatka (near Yavino and Oserkovsky) and in its southern part (Aniva Bay, Sakhalin). In North Japanese Sea the distribution of this form is also nearly parallel to the distribution of the typical *A. ochotensis*, but it goes farther to the south, and was found near to Peter the Great Bay (43° 45′ N., 135° 35′ E. in 90 fath.).

[4] A. P. Semenov-Tian-Shansky, Mém. Acad. Imp., St. Pétersbourg, ser. 8, vol. 30, No. 1. L. Berg, Biologic. Journal (Russian), 1910, No. 3. L. Berg, Les poissons des eaux douces de la Russie, 1916, p. xvii. V. L. Bianchi, Russ. Zool. Journ., vol. 1916.

ARTEDIELLUS MIACANTHUS Gilbert and Burke (1912)

Artediellus miacanthus Gilbert and Burke, Bull. Bur. Fish., vol. 30, 1910, (1912) p. 47, fig. 7.

Artediellus aporosus Soldatov, Ann. Mus. Zool. St. Pétersbourg, vol. 23, 1920, pp. 323–324.

D. VII–VIII, 12–14; *A.* 11–12; *P.* 20–24; *L. lat.* 17–24.

This species can be easily distinguished from all other Pacific forms by the smooth and losely attached skin, absence of the nasal spines, small number of in the lateral line and small number of pores on the top of the head. It is well described by American authors.

In our large collection, containing 47 specimens, the variation of the number of the pores is as follows:

Pores	17	18	19	20	21	22	23	24
Specimens	4	5	13	11	6	2	0	0

The variation in the number of the pectoral rays is as follows:

Rays	20	21	22	23	24
Specimens	2	4	17	17	7

Prof. V. K. Soldatov (Moscow) has described as a new species, *Artediellus aporosus*, a form nearly allied to *A. miacanthus*, but differing by the presence of "very small nasal spines wholly concealed beneath integument," in the absence of pores on the top of the head and in the smaller number of pectoral rays. But all these peculiarities are in my opinion insufficient for separating this form as a new species.

The nasal spines are completely concealed in the skin and not at all developed as spines; only by removing the skin can one detect sometimes blunt bony tubercles on the nasal bones, and the development of these tubercles varies.

The absence of pores on the top of the head is not especially mentioned by Gilbert and Burke, but the precision with which they describe "three pores in a cross series immediately behind the orbits, the middle one sometimes a little advanced" convince me that they have observed no additional pores on the top of the head.

The variation in the number of the pectoral rays given by V. K. Soldatov for *A. aporosus* is also the same as for *A. miacanthus:*

Rays	19	21	22	23
Specimens	1	1	5	2

Therefore after minute investigation of the specimens of *A. aporosus* I can not recognize this form as a separate species.

Geographical distribution—*A. miacanthus* is confined exclusively to the Okhotsk Sea and especially to its northern part. It was found in the Penshinskaya and in the Tauiskaya Guba and extends south to 50° 3′ N.

ARTEDIELLUS DYDYMOVI Soldatov (1915)

Artediellus dydymovi Soldatov, Ann. Mus. Zool. St. Pétersbourg, vol. 20, 1915, pp. 157–161, fig. 1.

D. VII–VIII, 11–13; *A.* 11–12; *P.* 19–24; *L. lat.* 26–33.

This species was described by Professor Soldatov and can be easily distinguished by the slender body, the presence of four praeopercular spines and of two large round bony tubercles on the occiput directed upwards.

Only one specimen has been added to our collection since this species was described. It is 74.3 mm. long and differs by having 26 pores in the lateral line and by a lower development of pores and of cutaneous cirri on the top of the head. It may perhaps constitute a special Bering Sea subspecies as it was found in this sea (57° 31′ N., 163° 17.5′ E., 54 fathoms).

Geographical distribution.—*Artediellus dydymovi* is widely distributed in the North Japanese Sea from the Peter the Great Bay to the Nevelskoy Strait and the mouth of the Amoor River. In the Okhotsk Sea it is also distributed from the Aniva Bay in the south to Ayan in the northern part of this sea. Our specimen shows that it is found also in the western part of Bering Sea.

ARTEDIELLUS SCHMIDTI Soldatov (1915)

Artediellus pacificus (part) Schmidt, Pisces Mar. Orient. Imp. Ross., 1904, pp. 101–103.

Artediellus schmidti Soldatov, Ann. Mus. Zool. St. Pétersbourg, vol. 20, 1915, pp. 160–161, fig. 2.

D. VII–VIII, 11–13; *A.* 10–12; *P.* 20–23; *L. lat.* 25–30.

This species can be distinguished from *A. dydymovi* Soldatov by the presence of 4 round bony tubercles on the occiput, of 4 well-developed praeopercular spines and of a more or less developed denticle on the upper praeopercular spine. But, if we take into consideration that the first pair of tubercles is developed from the enlarged supraocular rims and that in some specimens of *Artediellus dydymovi* we find the traces of such enlarged bony ridges fused to a kind of tubercle, it will be seen that the difference between both very nearly allied species is not considerable. It is possible that this species may be regarded only as a southern subspecies of *Artediellus dydymovi* Soldatov, but we have not yet material enough to settle this question.

Geographical distribution.—This species is now known only from the Aniva Bay (South Sakhalin).

ARTEDIELLUS SCABER Knipovitsch (1907)

Artediellus scaber KNIPOVITSCH, Mém. Acad. Imp. Sci. Pétersbourg, ser. 8, vol. 18, No. 5, 1907, pp. 15–29, figs. 7–12.

D. VIII–IX, 12–14; *A.* 10–13; *P.* 18–22; *L. lat.* 25–31.

This Arctic species described by Prof. N. M. Knipovitsch is well represented in our collection, as we have 25 specimens in addition to the 80 studied by him. Having thoroughly studied this material, I can add some new observations.

The nasal spines of this species are obsolete or developed as small tubercles hidden in the skin. The pores on the head are not developed; there are only 6–7 subocular pores and one pore between the eyes on the line connecting their hinder margins. These peculiarities show us that this species is nearly allied to *Artediellus miacanthus* Gilbert and Burke and is also connected with this Pacific species by our new subspecies *beringianus* described on page 8.

The cutaneous prickles, characteristic of this species, are distributed mostly in the following manner. They cover the dorsal side of the body before the first dorsal and on both sides of this fin, but behind them they form two bands or sometimes only two rows, one along the basis of the second dorsal and the other over the lateral line; these bands go to the base of the caudal.

Some of the specimens have very small cutaneous cirri over the eyes and on the occipital prominences.

Three specimens in the collection studied by N. M. Knipovitsch have a very peculiar coloration not described by this author. The male (No. 14205) (length of the body 64.5 mm.) has behind the occipital prominences a broad milk-white band, reaching on the sides to the lateral line and extending to the base of the caudal fin. The white color can be observed also on the front part of dorsal fin. A milk-white spot can be seen on the nasal part of the head and small white spots on the upper lip, on the praeopercle, and on the base of the pectoral. In the hinder upper edge of the first dorsal is a round black spot. On the dorsal, caudal, and pectoral fins are dark-brown crossbands, and not so dark bands are on the anal.

A female (No. 14205) (length of the body 61.7 mm.) has a milk-white spot before the first dorsal, but it splits in two narrow white bands, one extending over the lateral line and the other along the bases of the first and the second dorsal fins. A small white spot is on the praeopercle.

The other female (No. 14205) (length of the body 58.5 mm.) has only a milk-white spot on the nose and a small white spot before the first dorsal fin.

One specimen in our new collection (No. 21298, length of the body 46.5 mm.) has also a milk-white spot on the nose.

Geographical distribution.—According to the collection of the Zoological Museum, this species is largely distributed in the Arctic Ocean near the Siberian coasts from 44° E. to 173° 24′ W. (near Bering Strait) and was found in Barents Sea in 79° 45′ N., in Kara Sea in 76° 59′ 30″ N., and in Nordenskjöld Sea (Siberian Arctic Ocean) in 75° 38′ N. It is a true Arctic species.

ARTEDIELLUS SCABER BERINGIANUS, ne

D. VIII, 13; *A.* 10–11; *P.* 20–23; *L. lat.* 24–27.

The structure of the head and of the body is entirely similar to that of *Artediellus scaber* (typical). The head, the operculum, the praeoperculum, and the occiput are covered with small cutaneous prickles; a narrow band of these prickles go also along the base of the first dorsal fin, but no more prickles on the body are observed. Supraocular and occipital cirri are long; shorter cutaneous cirri, evidently originated from elongated prickles, form a row along the base of the first dorsal fin. One of the two specimens (70.5 mm.) has only 4 such cirri in this row, the other (55 mm.) has 3 longer and 6–8 shorter cirri along the base of dorsal fin. Maxillary barbels are short. Three cutaneous cirri are placed over the lateral line, forming a second short row. Three other cutaneous cirri are on the praeoperculum and one on the operculum. There are 6–7 subocular pores, 2 small pores before, and 3 pores behind each eye.

Coloration is light brown with small dark brown spots, not forming regular bands. Behind the eyes is a broad white (not milky) band to the margin of the praeopercle. A white spot on the base of the first dorsal. On the first and the second dorsal, on pectoral and caudal fins are dark cross bands.

From the typical form of *Artediellus scaber* Knipovitsch this form differs chiefly in the smaller development of the cutaneous prickles and by two rows of cutaneous cirri. But these cirri are sometimes developed also by many specimens of the Arctic Ocean (as by No. 21305, Zool. Mus. Leningrad). The presence of the well-developed cirri on the head brings this form in near connection with *Artediellus ochotensis* Gilbert and Burke and other Pacific species.

Geographical distribution.—Both specimens were found in Tkatchen Bay (64° 25′ N., 172° 48′ 3 W.) in the northern part of the Bering Sea.

ARTEDIELLUS UNCINATUS Reinhardt (1837)

Cottus uncinatus REINHARDT, Dansk. Vid. Selsk., Nat. Math. Afh. 1837, p. liv; 1838, pp. 117, 118.
Centridermichthys uncinatus SMITT, Scand. Fishes, pt. 1, 1892, p. 163.
Artediellus atlanticus JORDAN and EVERMANN, Bull. U. S. Nat. Mus. No. 47, Fish. North and Middle Amer., pt. 2, 1898, p. 1906.
Artediellus uncinatus KNIPOVITSCH, Mém. Acad. Imp. Sci. St. Pétersbourg, p. liv; 1838, pp. 117, 118.

This species described first by Reinhardt from Greenland, differs, as shown by Knipovitsch, from the European form. Having compared now some of our specimens from the Davis Strait (from the collections of United States National Museum in Washington) with other specimens of our Leningrad collections from Spitsbergen and Barents Sea I agree completely with this opinion. The incorrect drawing of Collett[6] with bony protuberances provided with radiating ridges, has led Jordan and Evermann to describe a new species *Artediellus atlanticus*, differing chiefly in having "blunt protuberances on the occiput." But the bony tubercles are completely alike in both forms, American and European. They are blunt, triangular in shape from the side, directed backward and developed in different degree.

This species differs from *Artediellus europaeus* Knipovitsch, in having 27–30 pores in the lateral line instead of 20–23 pores, and curiously enough it is the same difference that we find between the eastern and western species in the Pacific Ocean, namely, between *Artediellus pacificus* and *A. ochotensis*, as shown in the following table:

	Eastern part	Western part
ATLANTIC OCEAN	*Pores*	*Pores*
Artediellus uncinatus	----------	27–30
Artediellus europaeus	20–23	----------
PACIFIC OCEAN		
Artediellus ochotensis	----------	27–33
Artediellus pacificus	22–26	----------

The coloration of the American species seems also to be very peculiar, as on the dorsal and on the pectoral fins we find rows of round white spots, not connected to continuous crossbands, as in the European form.

Our material is not large enough for establishing these two species with full certainty, but as we have no forms with intermediate num-

[6] Norske Nordhavs Exped., vol. 3, 1880, Fishes, pl. 1, fig. 7.

ber of pores in the lateral line, we must still consider them as two different species.

Geographical distribution.—This species is known from Greenland, Davis Strait, and the east coast of North America from Labrador southward to Cape Cod.

ARTEDIELLUS EUROPAEUS Knipovitsch, 1907

Artediellus uncinatus (part), SMITT, Scand. Fishes, pt. 1, 1892, p. 163.
Artediellus uncinatus JORDAN and EVERMANN, Bull. U. S. Nat. Mus. No. 47, Fish. North and Middle Amer., pt. 2, 1898, p. 1905.
Artediellus europaeus KNIPOVITSCH, Mém. Acad. Imp. St. Pétersbourg, ser. 8, vol. 18, No. 5, 1907, p. 17.

This form confused by other authors with the American form, the true *Artediellus uncinatus* Reinhardt was separated by Knipovitsch as a different species.

The number of pores in the lateral line is 27–30. On the dorsal and pectoral fins the white crossbands on the dark brown ground are continuous and not formed by rows of round white spots. The length of the pectoral fins is given by Knipovitsch as 22–24.9 of the length of the body, but in this respect there is a very small difference between this species and the *Artediellus uncinatus* Reinhardt, as this last species has the fins of 22.7-26.7% of the length of the body. The length of the body (measured with caudal fin) can, according to specimens in the Leningrad collection, reach 133.5 mm.

Geographical distribution.—This species is distributed in the eastern part of the Atlantic Ocean. It is known from Spitsbergen, west coast of Norway, and the Murman coast (Barents Sea).

O

A NEW TYPE OF CADDIS CASE FROM THE LOWER EOCENE OF TENNESSEE

By Edward W. Berry

Of the Johns Hopkins University, Baltimore, Md.

The fossil remains of the cases of Caddis larvae are not so common as not to be noteworthy, and an especial interest attaches to the peculiar type described in the following note, which is also the earliest case, so far as I know, to be recorded from North America.

In the preliminary account of the flora of the Wilcox group certain arthropod remains were referred to somewhat incidentally,[1] and, on the authority of Miss Mary J. Rathbun, were tentatively assigned to the isopod genus *Ligyda* Rafinesque (*Ligia* Fabricus). Subsequent field studies have shown that these remains are exceedingly common at certain localities in the Holly Springs sand, the middle formation of the Wilcox group in northern Mississippi, and the basal formation of this group in western Tennessee.

I have never been satisfied with the identification of these fossils as isopods, and having observed a leaf-like venation on the segments in the better preserved specimens, I concluded that they represented some Wilcox species of Caddis case. Recently Prof. J. G. Needham has examined specimens for me and verified my conclusions, and I am also indebted to him for various references to the literature on the recent Trichoptera. Since, as previously remarked, the fossil remains of this interesting order of insects are by no means common, and since none with larval cases of this type of manufacture have been found fossil heretofore, they merit careful description.

As it is altogether impossible, from the cases alone, to be sure of their generic identity, the pseudogeneric term *Folindusia*, meaning wrapped in leaves, has been coined for their designation. This is in conformity with the use of *Indusia* as a similar pseudogeneric term for fossils of the familiar sand grain type of tube. Following the usual taxonomic method the present fossils may be called *Folindusia wilcoxiana* and described as follows:

FOLINDUSIA, new genus

FOLINDUSIA WILCOXIANA, new species

Cases large, flat, two faced, constructed entirely of cut fragments of drift leaves. About 3 times as long as wide, usually decreasing in width posteriorly, but never more than 2/7's, and often scarcely perceptibly. The end pieces are normally nearly semicircular, and

[1] Berry, E. W., U. S. Geol. Survey Prof. Paper 91, p. 33, pl. 111, figs. 7, 8, 1916.

the intervening ones are rough parallelograms, placed side to side, so that the lines of union are almost exactly transverse. The individual pieces appear to be normally fastened edge to edge and not overlapped, although in some cases they show evidence of overlapping as in Figure 5 where the anterior piece is nearly circular and a considerable overlap can be discerned. The lateral edges may be slightly rounded, but are usually rather evenly cut and fitted, so that the lateral margins of the case are approximately straight. Occasionally all of the pieces are roughly semicircular, as in the specimens originally figured, resulting in an angulated margin and heightening the resemblance of the case to the metameres of an arthropod body. (Figs. 1 to 5.) In all instances the leaf pieces appear to have been cut out of large leaves, and none show a leaf margin. In this respect the fossils differ from all recent species of similar habit that I have been able to find.

Occasionally a specimen will have part of one face missing and will show that these envelopes had two opposite faces covered with leaf cuttings as in the comparable existing forms. These leaf pieces are seen to be roughly alternating on the two surfaces. No traces of a central tube can be discerned in the relief of the specimens, so that the internal tube must have been silky, as in modern forms, and of slight bulk or resistance to the pressure developed during fossilization.

No specimens show any trace of the incorporation of any small sticks or other foreign materials, but are built entirely of rather uniformly cut pieces of leaves. These are all dicotyledonous except in two instances where a parallel-veined monocotyledon has been used. The number of pieces per case is 6 to 8 on each face. The cases average about 2.5 centimeters in length and their width varies from 4 to 10 millimeters, and averages nearest to the last figure.

Specimens have been obtained from the following localities: Puryear, 2 miles west of Henry, and Foundry Church Pit in Henry County; 1 mile west of Milan in Gibson County; $\frac{1}{4}$ mile south of Mandy, $2\frac{1}{10}$ miles northwest of Mercer, and $3\frac{1}{4}$ miles northeast of Jackson in Madison County; from several outcrops near the town of LaGrange in Fayette County; and from Mill Creek in Hardeman County.

The portable cases of caddis larvae are constructed of almost every material that is to be found in the water and in an almost endless variety of form. The material is cemented by a silk-like salivary secretion. Frequently there is considerable variation in the material used and the form of the cases, not only in a single genus, but even in a single species. Lloyd, however, makes the statement that the trained observer can usually determine the cases.

The Wilcox leaf cases appear to me to be referable to the family Limnophilidae. This is a large and widely distributed group in the existing fauna, especially prominent in ponds and slow streams, but

also fitted for life in almost every aquatic environment, and in the European genus *Enoicyla* the larvae afford the only known instance in the whole order of a terrestrial habitat.

In this family the variety in construction and material of the cases is great, and no general statements can be made. Several of the genera utilize leaf fragments. For example, *Arctoecia consocia* builds a three sided case of leaf pieces: several species of *Limnophilus* utilize leaf fragments: *Glyphotaelius hostilis* makes a case of imbricated leaf pieces, and the allied *Glyphotaelius punctato-lineatus* of Europe constructs a two faced case of leaf pieces much like the fossil. (Fig. 6.) Several of the genera of Limnophilidae change the architecture and material of their cases seasonally (as *Arctoecia*, *Pycnopsyche*, etc.). This is true of *Pycnopsyche scabripennis* as described by Lloyd.[2] In this species the larvae construct flat cases of leaf pieces during the winter and spring months, and these are very similar to those of the fossil. In late spring the tube becomes tougher, bark fragments are added, the broad roof and floor of leaves is discarded, and a heavy "ballast" stick is added on each side. These last prevent the cases from being upset or rolled by currents exactly as did the form of the earlier flat leaf cases.

No traces of such seasonal modifications have been observed in the fossil. The innumerable specimens seen are all built on the same plan and of the same material, and it seems a legitimate deduction that the seasonal change noted above is an acquired habit which was not present in this lower Eocene species. The evidence for this has all the weakness inherent in negative evidence, but the abundance of the leaf cases, the fossilization of all sorts of delicate objects such as flowers in these fine muds, and the large amount of unusually thorough collecting from the Wilcox clays, tends to preclude the absence of modified cases as attributable to accidents of preservation or discovery.

The special construction of the cases of *Folindusia wilcoxiana* to prevent their capsizing indicates that their habitat was a region of some current action. The general environmental picture of this area during the time of deposition of that part of the Holy Springs sand containing these caddis cases, is of a low, abundantly forested, warm temperate coast, with bayou-like stream distributaries emptying into lagoons ponded behind extensive barrier beaches, beyond which the gulf waters were extremely shallow, and not typically marine for a considerable distance.

The somewhat earlier transgressive phase of the Holly Springs sand shows, in the frequent foreset bedding of the sediments, and in the presence of clay conglomerates, as well as in the abundance of drifted fruits and seeds, evidence of stronger stream action than prevailed later when the caddis larvae swarmed in the waters.

[2] Lloyd, J. T., Bull. Lloyd Library, Ent. series, No. 1, pp. 60–63, 1921.

Regarding the known geologic distribution of the Trichoptera (Phryganoidea) it may be stated that upwards of a score of species from the Mesozoic have been referred to this order. The oldest come from the Lias of Germany and England (*Trichopteridium* Geinitz, *Phryganidium* Westwood, and *Necrotaulius* Handlirsch, the last made the type of an extinct family—the Necrotaulidae). Supposed Trichoptera occur at various other Jurassic horizons, especially in the Purbeck, and these are mostly wing specimens of somewhat uncertain affinities, as is also the Upper Cretaceous occurrence of western Tennessee referred to *Dolophilus* (?).

The oldest larval case that has come to my notice is *Phryganea micacea* Fritsch from the littoral middle Cretaceous (Cenomanian) of Bohemia. There have been about 200 species described from the Tertiary, based upon wings, cases, and sometimes imagos, which last are common at Florissant (Aix, Parschlug, Manebach, Isle of Wight, west Greenland). The oldest previously known American cases are from the middle Eocene Green River Beds of the West (Auversian).

A large variety of Trichoptera have been described from the Baltic amber (Lattorfian). These include the genera *Agrypina*, *Apheilocheira*, *Aspatherium*, *Cyrnus*, *Halesus*, *Hydropsyche*, *Hydroorchestria*, *Hydroptila*, *Limnophilus*, *Neuronis*, *Phryganea*, *Phryganeolitha*, *Polycentropus*, *Psychomyia*, *Rhyacophila*, *Tinodes*, etc. Trichoptera tubes form an indusial limestone in the Auvergne (Aquitanian or lower Miocene) which is in places several feet thick over considerable areas in central France. Their remains are common in the Miocene lake basin of Florissant, Colorado, where a number of genera, several of which are extinct, and about 25 species have been described (*Dorobrochus*, *Leptobrochus*, *Limnophilus*, *Limnopsyche*, *Litobrochus*, *Mesobrochus*, *Neuronia*, *Paladicella*, *Phryganea*, *Polycentropus*, *Tinodes*, etc.).

There are over 1,400 recent species of Trichoptera, segregated in 13 families. They are cosmopolitan, but are said to be most abundant in the north temperate zone. The lavae inhabit all sorts of fresh-water environments from torrents to stagnant swamps and temporary pools. All are fresh water except a marine form in New Zealand, and a terrestrial species in Europe.

EXPLANATION OF PLATE

FIGS. 1–5. *Folindusia wilcoxiana* Berry, nat. size. 1 and 5 are from Puryear and 2–4 are from the Grable Pit 2 miles west of Henry, both in Henry County, Tenn.

6. Leaf case of *Glyphotaelius punctato-lineatus*, one of the recent Limnophilidae (after Rousseau) from Europe.

7. Leaf case of *Pycnopsyche scabripennis*, another of the recent Limnophilidae (after Lloyd) from the eastern United States.

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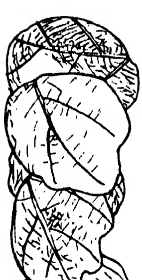

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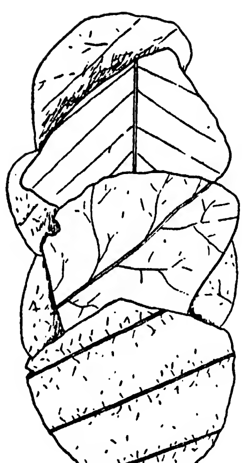


7

5

A NEW CADDIS CASE FROM THE LOWER EOCENE

FOR EXPLANATION OF PLATE SEE PAGE 4

ON FOSSIL TURTLES FROM THE PLEISTOCENE OF FLORIDA

By Charles W. Gilmore
Curator of Vertebrate Paleontology, United States National Museum

INTRODUCTION

In the collections of vertebrate fossils made in Florida by the joint Amherst-Smithsonian Expedition in 1925 and by Dr. J. W. Gidley in 1926 are a number of well-preserved turtle specimens pertaining to the genus *Terrapene*. One of these, presented to the United States National Museum together with other fossil specimens by Mr. C. P. Singleton, of Melbourne, Fla., represents a new species, and I take pleasure in naming it in his honor.

The other specimens to be described belong to the little known *Terrapene canaliculata* Hay, and their description gives us for the first time a complete knowledge of the carapace and plastron, and thus places the species on an adequate basis.

At this time I take pleasure in acknowledging my obligation to Dr. F. B. Loomis for his generosity in placing the excellent Amherst College specimens in my hands for study and description.

TERRAPENE SINGLETONI, new species

Plate 1

Type.—No. 11,181, United States National Museum; consists of the greater part of a well-preserved carapace. Collected by C. P. Singleton, 1924.

Type locality.—Two miles west of Melbourne, Brevard County, Fla.

Horizon.—Pleistocene.

A nearly complete carapace of an extinct box turtle included in a collection of Pleistocene fossils presented to the United States National Museum by Mr. C. P. Singleton, of Melbourne, Fla., displays features which show it to be an undescribed species, and the name *Terrapene singletoni* is therefore proposed for its reception.

When received at the museum the specimen was attached by matrix to the lower end of the femur of *Mastodon americanus*, No. 11,185, U.S.N.M., a partial skeleton, including the skull, tusks, and lower jaw.

The carapace, except for the loss of a small area on the right hinder side, is uncrushed and in an excellent state of preservation. All of the bones are solidly united, so that none of their sutural contacts can now be determined; hence the form of the individual bones is unknown.

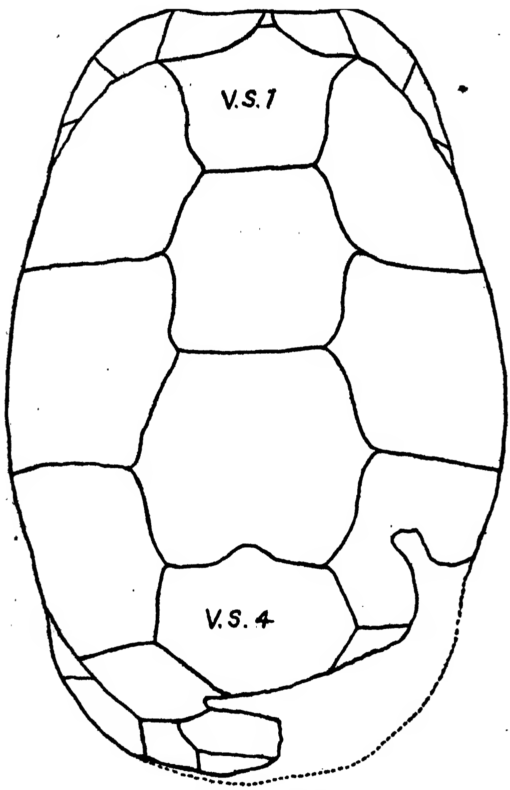


FIG. 1.—CARAPACE OF TERRAPENE SINGLETONI. No. 11,181, U.S.N.M. TYPE V. S. 1, FIRST VERTEBRAL SCUTE; V. S. 4, FOURTH VERTEBRAL SCUTE. ONE-HALF NATURAL SIZE

The bone of the carapace is somewhat thickened when contrasted with the very thin shells of *Terrapene innoxia* Hay and *T. formosa* Hay[1] from these same deposits.

The shell is relatively long and narrow when contrasted with the known species of the genus, highest at the center and sloping off more rapidly behind than in front. It is estimated that the complete carapace had a greatest length, taken in a straight line at the center, of 200 mm. and a greatest width of 132 mm. These measurements show the width to be 0.66 of the length, whereas in the living *T. carolina*, as given by Hay,[2] the ratio is 0.86, and in the extinct species, *T. formosa*, *T. innoxia*, and *T. canaliculata*, is 0.72, 0.68, and 0.70, respectively.

The nuchal border is broadly and shallowly excavated, resembling in this respect adult specimens of *T. major*. The borders of the

[1] Hay, O. P., Ann. Rept. Florida State Geol. Survey, 1916, pp. 57–58 and 61–64, pl. 4, fig. 3; pl. 6, figs. 3 and 4.
[2] Idem, p. 57.

carapace, both in front and behind, are very slightly flared upward, and there is no lateral keel above the bridge, both features which serve to distinguish it from the larger *T. canaliculata* Hay. A low, flattened median keel traverses the first, second, and third vertebral areas but is inconspicuously developed on vertebrals four and five. The posterior peripherals are greatly thickened when compared with such species as *T. formosa* Hay and the extant *T. major*, and relatively thicker than the much larger *T. canaliculata* from these same deposits.

In the thickening of the peripherals this species resembles *T. innoxia* Hay, as it does in the elongated shape of the carapace. In size, however, it is fully twice as large as the type of *T. innoxia.*

The sulci which separate the various scutes are deeply impressed and thus clearly outline their respective boundaries. The vertebral scutes reflect the elongate nature of the shell in being nearly as long as they are wide. The form of these scutes is clearly depicted in the illustrations, and their dimensions are given in the table below:

Measurements of vertebral scutes

Vertebral scutes	Length	Width
	Mm.	*Mm.*
1	45.1	45.5
2	45.0	44.0
3	44.0	54.0
4	[1] 48.0	[1] 48.0
5	[1] 34.0	[1] 45.0

[1] Estimated.

Four extinct species of *Terrapene* have been recognized from Florida; *T. formosa* Hay, *T. innoxia* Hay and *T. canaliculata* Hay from the Pleistocene, and *T. putnami* Hay doubtfully from the Pliocene. A fifth species, *Terrapene singletoni*, here described, may be at once distinguished from *T. innoxia* and *T. formosa*, in fact from all other species with the exception of *T. canaliculata* and *T. putnami* by its much larger size. From *T. canaliculata*, which it most nearly resembles, it is distinguished by its smaller size, thinner shell, absence of lateral keel above the bridges, relatively narrower carapace, with greatest width at the middle, first vertebral widest at the anterior end and with thickened posterior peripherals that are but little flared upwards.

TERRAPENE CANALICULATA Hay

Plates 2, 3, 4, and 5

Terrapene canaliculata HAY, O. P., Bull. Amer. Mus. Nat. Hist., vol. 23, 1907, p. 850, figs. 5–7; Fossil Turtles of N. A., Carnegie Institution of Washington, 1908, pp. 363–364, figs. 463–465.

Terrapene antipex HAY, O. P., 8th Ann. Rept. Florida Geol. Survey, 1916, pp. 58–61, pl. 4, figs. 4, 5; pl. 5, figs. 1–5.

In 1907 Dr. O. P. Hay established a new species of box turtle, *Terrapene canaliculata* on some fragmentary remains, No. 5500,[3] United States National Museum, found on either Whitemarsh or Skedaway Island, below Savannah, Ga. Since its establishment nothing has been contributed to a further knowledge of the species and it was therefore of interest to find in the collections made in Florida by the joint Amherst-Smithsonian Paleontological Expedition of 1925, and by Dr. J. W. Gidley in 1926, four well-preserved specimens which may be attributed to this little known species.

A study of these specimens in conjunction with the type now gives a comprehensive understanding of the entire shell structure, and for the first time adequately establishes the species. Furthermore, a study of this new material in conjunction with the type and other specimens attributed to *Terrapene antipex* by Hay, from the Pleistocene of Florida leads to the conclusion that all are one and the same thing and consequently *T. antipex* becomes a synonym of *T. canaliculata* which has priority by several years.

The identification of the present specimens with the fragmentary type of *T. canaliculata* rests upon the large size of the individuals, the presence of a sharp longitudinal keel running from the free border of the anterior peripherals to that of the posterior peripherals; the development of a gutter-like groove above the keel, which is especially pronounced on peripherals four and five; the decided outward flare of the posterior peripherals, a development that begins on the seventh, and the relatively thick bone forming the shell. The more detailed comparison of the above-mentioned specimens will be found in the description to follow.

The species *Terrapene antipex* Hay was founded on fragmentary parts of carapace and plastron pertaining to several individuals of which a complete posterior plastral lobe, No. 8,820 U.S.N.M., was selected as the type. This specimen was collected at the now famous Vero locality, Saint Lucie County, Fla., and it was at this same locality that two of the specimens, No. 11,330 U.S.N.M. and No. 25–144 Amherst College, here referred to *Terrapene canaliculata* Hay were found. The large size of these *Terrapene* specimens at

[3] Not catalogue No. 6211 U.S.N.M. as originally given by Hay.

once raised the question of their specific identity. Fortunately, one of the newly discovered specimens, No. 11,428 U.S.N.M., had the plastral part of the shell preserved so that direct proof of its identity with the type of *T. antipex* was to be obtained. Both are males, as shown by the concavity of their posterior lobes. No. 11,428 is slightly larger than the type, but with the exception of some minor differences is in such close agreement with it in contour, arrangement, and extent of the plastral scutes, as to leave no doubt of their specific identity. Further substantiation of the identity of *T. antipex* with *T. canaliculata* was found in comparing the type lobe of the former with a fragmental portion of the hinder lobe belonging to the type of *T. canaliculata.* Here again, except for a slight difference in size, the closest resemblances were found.

At the time of describing *T. antipex*, Hay[4] recognized its close relationship with *T. canaliculata*, but chose to consider them as distinct species for the reasons that in *T. antipex* "the lateral keel is much more conspicuous, the free borders of the peripherals are more strongly recurved, and the shell is still thicker and heavier." It will be observed that all of the differences noted are those of degree, and well represent the variations in structure to be found within the species; in fact, such differences are noted in a comparison of the specimens now before me.

Description.—The description to follow of the shell structure of *Terrapene canaliculata* is based upon the following new materials: No. 11,428 U.S.N.M., a nearly complete carapace and plastron collected by Dr. J. W. Gidley in 1926 on the "Golf Course Locality," 2 miles west of Melbourne, Brevard County, Fla., from Sellard's No. 2 level; No. 11,330 U.S.N.M., a carapace in two disconnected parts; the complete right anterior fourth extending across the midline and the complete left side and rear past the middle, collected by Dr. J. W. Gidley, near Sellard's locality (Sellard's level No. 2), Vero Beach, St. Lucie County, Fla.; No. 25–144 Amherst College, a complete carapace collected by Dr. F. B. Loomis at Vero, Fla., from Sellard's No. 2 level; No. 25–145, A.C., a nearly complete carapace collected by Dr. F. B. Loomis, from the bank of the canal, 1 mile north of the center of the town of Melbourne, Brevard County, Fla.

Primarily the description to follow is based upon the best preserved specimen, No. 11,428 U.S.N.M., although much supplementary information is furnished by the other specimens enumerated above. All of the specimens are fully adult individuals having the bones of the shell so firmly united that the forms of the neural, costal and peripheral bones are largely unknown. A few costal and peripheral sutures can be detected in specimen No. 11,330 U.S.N.M.,

[4] Eighth Ann. Rept. State Geol. Survey of Florida, 1916, p. 61.

but these give only a hint of the detailed bony structure of the shell.

The thickness of the bone of the carapace, as in the type, is comparatively heavy. Viewed from above (see Plates 2 and 3), the carapace is suboval in outline, being wide and broadly rounded behind. It gradually narrows toward the front, the anterior border being truncate with a broad but shallow emargination above the neck.

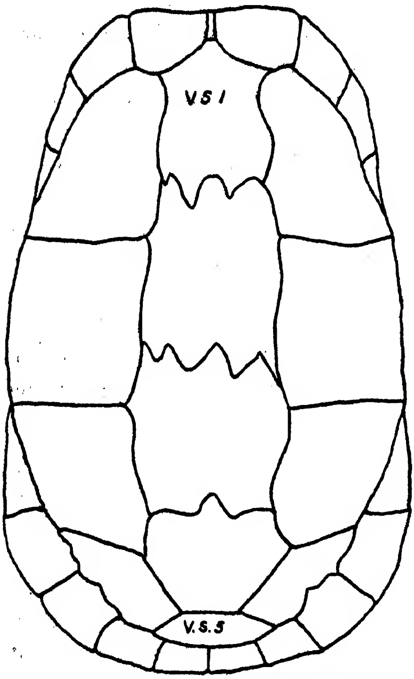


FIG. 2.—CARAPACE OF TERRAPENE CANALICULATA HAY. NO. 25–144, AMHERST COLLEGE MUSEUM. V. S. 1, FIRST VERTEBRAL SCUTE; V. S. 5, FIFTH VERTEBRAL SCUTE. ONE-THIRD NATURAL SIZE

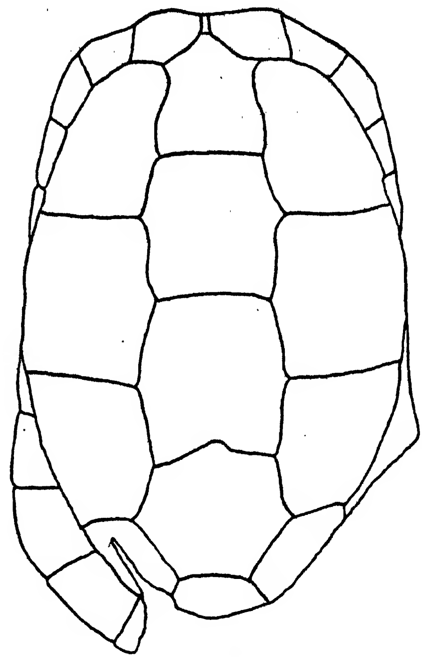


FIG. 3.—CARAPACE OF TERRAPENE CANALICULATA HAY. NO. 25–145, AMHERST COLLEGE MUSEUM. ONE-THIRD NATURAL SIZE

The carapace of No. 11,428 U.S.N.M. has a greatest length in a straight line through the middle of 262 mm., and a greatest width across the eighth peripherals of 185 mm.; the width thus being 0.70 of the length. At the center the shell has a height of about 110 mm. The other specimens have the same proportions. The sulci outlining the scutes are narrow but well defined and those bounding the vertebrals are especially deep and conspicuous.

Along the center of the back within the area of the vertebral scutes, the carapace is somewhat flattened. A low, rounded keel is present, being more especially conspicuous on vertebral three.

This keel is not continuous but is interrupted at the vertebral sulci separating the scutes; widest at the front of the scute it gradually narrows and completely subsides before reaching its posterior extremity. In specimens Nos. 11,428, 11,330 U.S.N.M., and No. 25–144 A. C. there is only the faintest suggestion of a median keel, whereas in No. 25–144 A. C. it is strongly developed at the anterior end, as shown in plate 2. Vertebral one has the center raised into a prominent obtusely rounded elevation that extends longitudinally the full length of the scute. The prominence of this ridge seems to be one of the distinctive features of the species. An incipient ridge is present in *T. innoxia*, *T. singletoni*, and in the living *T. major*, but none of these show such a conspicuous development as in the species under discussion.

The vertebrals are relatively long and narrow for a *Terrapene* resembling *T. singletoni* in this respect. Their measurements are given in the table below:

Measurements of vertebrals

No.	Length				Width			
	No. 11,428 U.S.N.M.	No. 11,330 U.S.N.M.	No. 25–144 A.C.	No. 25–145 A.C.	No. 11,428 U.S.N.M.	No. 11,330 U.S.N.M.	No. 25–144 A.C.	No. 25–145 A.C.
	Mm.	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*
1	60	57.5	58	57	49.0	48	47	45
2	56	53.0	58	52	59.0	58	58	52
3	57	--------	58	56	64.0	--------	59	58
4	60	--------	57	57	64.0	--------	59	60
5	41	40.0	44	--------	53.5	52	57	56

The urnshaped form of the first vertebral is another feature that seems to be distinctive of this species. Anterior of its mid length the scute is strongly constricted as shown in Figures 2 and 3 and in three of the four specimens now before me all have the posterior half of this scute as wide, or wider than the anterior end. Comparative measurements are given in the table below:

Name	Width anterior end	Greatest width posterior to middle
Terrapene canaliculata:	*Mm.*	*Mm.*
No. 25–144 A. C.	47.0	47
No. 25–145 A. C.	39.5	49
No. 11,330 U.S.N.M.	42.0	49
No. 11,428 U.S.N.M.	53.0	53
Terrapene singletoni, type	46.5	36
Terrapene innoxia, type	26.0	21
Terrapene longinsulae, type No. 5983 U.S.N.M.	31.5	25
Terrapene major	35.0	30
Terrapene carolina	31.0	26

In most species of the genus *Terrapene* both living and extinct, the anterior end of the first vertebral is decidedly the widest. The transverse sulci separating vertical scutes one and two, and two and three, in specimen No. 25–144 A. C., differs from the other two specimens in the strong interdigiting character of its course, as plainly depicted in Figure 2. In the other specimens of this species these sulci take a more or less straight course, or with only a forward median loop. This median loop, which is only faintly developed in No. 25–145 A. C., is conspicuously developed in No. 11,330 U.S.N.M.

The posterior peripherals are strongly flared outward and slightly upward. From the free border of the peripherals behind the hinge line a decided sharp edged keel runs forward and joins the free border of the anterior peripherals. The lateral peripherals immediately in front of the anterior hinge attachment have their outer borders strongly rolled up so as to form a shallow gutter, but forward this roll gradually subsides, leaving the upper surface evenly and shallowly concave. The nuchal scute is very much reduced and on the upper surface of two of the specimens now before me it barely reaches the free border of the shell. It has a length of 15.5 mm., and a width at the posterior end of 5 mm.

The height of the supracaudals is 16 mm. in No. 25–144 A. C. and 18 mm. in No. 11,330 U.S.N.M. and have a combined width of 48 and 50 mm., respectively. The hinder peripherals are strongly flared outward relatively more than in *T. major*, which is living in this region to-day. They are turned upward so that their lower surfaces are horizontal.

The lateral hinge articulation in No. 25–144 A. C. had a total length of 87 mm., of which 62 mm. may be attributed to the posterior lobe. Its thickness is 10 mm.

Specimen No. 11,428 U.S.N.M. is unique in being the first member of the present species found to have a complete plastron associated with the carapace, and this association was of the greatest importance in definitely deciding the status of *T. antipex*, which was based primarily upon a complete posterior lobe. In addition, there are portions of four plastra, all from the Melbourne locality, none of which could clearly be associated with carapacal parts. These are No. 11,369 U.S.N.M., anterior plastral lobe; No. 11,370 U.S.N.M., greater part of a posterior lobe; No. 11,371 U.S.N.M., anterior half of a posterior lobe; and No. 11,386 U.S.N.M., anterior half of a posterior lobe. The description to follow is based upon the plastron of specimen No. 11,428 U.S.N.M. Its greatest length taken at the center is 242 mm. The anterior lobe is 93 mm. long and 135 mm. wide on the hinge border; the posterior lobe is 150 mm. long and 145 mm. wide.

The anterior lobe as in most of the box turtles is convex from back to front on the ventral surface. The lateral posterior borders are slightly constricted behind the pectoral-humeral sulcus, but more forward rapidly round inward to the broad but slightly convex anterior border of the lip. The hinge border is slightly sinuous with a pronounced groove across its posterior median surface. At the center of the hinge the bone has a thickness of only 7 mm. but thickens to 10 mm. toward either side. Specimen No. 11369 U.S.N.M., a smaller individual, has a thickness of 13.5 mm. at the middle, exceeding the type of *T. antipex*. On the upper side above the gular area the lobe is broadly excavated and the lip portion is shallowly concave transversely, which has a greatest width of about 59 mm. The horn-covered upper surface is 16 mm. wide. The forms of the scutes are shown in Figure 4. The triangular gular scutes have a greatest length on the midline of 44 mm.; the humerals 25 mm., and pectorals 22 mm. The borders of the entoplastron can not be made out in this specimen. In a detached lobe attributed to this species, Hay[5] describes it as being circular with a diameter of 44 mm. The posterior two-thirds of thefree border is acute.

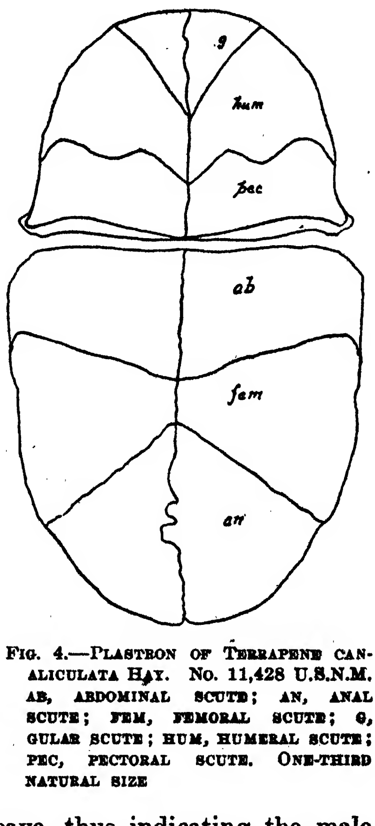


FIG. 4.—PLASTRON OF TERRAPENE CANALICULATA HAY. NO. 11,428 U.S.N.M. AB, ABDOMINAL SCUTE; AN, ANAL SCUTE; FEM, FEMORAL SCUTE; G, GULAR SCUTE; HUM, HUMERAL SCUTE; PEC, PECTORAL SCUTE. ONE-THIRD NATURAL SIZE

The posterior lobe, as in the type of *T. antipex*, has all of the bones consolidated into one piece (see Plate 5). The course of the hypo-xiphiplastral suture is scarcely distinguishable. The under surface of this lobe is deeply and broadly concave, thus indicating the male sex of the individual. At the midline in front, the bone has a thickness of 8 mm., but becomes thicker posteriorly. The lateral hinge lines are 47 mm. long. The horn-covered surfaces posterior to the lateral hinges are 20 mm. wide. The free edges are acute. There is a slight constriction at the femoral-anal sulcus, but otherwise the lobe presents an evenly rounded border that is slightly notched on the midline. Measured at the center the xiphiplastron has a length of 85 mm., the hypoplastron 65 mm. The median

[5] Eighth Ann. Rept. State Geol. Survey of Florida, 1916, p. 59.

sulcus separating the scutes of the two sides runs a very irregular course.

Terrapene canaliculata is with the possible exception of *T. putmani* Hay, from the Peace Creek beds, the largest species of the genus, and certainly the largest Pleistocene form.

At this time the main distinguishing features of this species are its large size; shell thick and heavy; carapace with its free borders curved upwards; posterior peripherals widely flaring; keel over the bridges connecting free borders of the front and back peripherals; gutter-like groove above this keel; first vertebral strongly urn-shaped with portion posterior to the middle as wide but usually wider than the anterior end; strongly elevated median longitudinal ridge, extending full length of first vertebral; median, keel out interrupted by transverse sulci.

EXPLANATION OF PLATES

Plate 1

Terrapene singletoni, new species, No. 11,181 U.S.N.M. Carapace viewed from above. Specimen from Melbourne, Brevard County, Florida. About ¾ natural size.

Plate 2

Terrapene canaliculata Hay No. 25–144 Amherst College Museum. Carapace viewed from above. Specimen from Vero, St. Lucie County, Florida. About ⅝ natural size.

Plate 3

Terrapene canaliculata Hay No. 25–145 Amherst College Museum. Carapace viewed from above. Specimen from Melbourne, Brevard County, Florida. About ⅝ natural size.

Plate 4

Terrapene canaliculata Hay No. 25–145 Amherst College Museum. Carapace viewed from the left side. About ⅝ natural size.

Plate 5

Terrapene canaliculata Hay No. 11,428 U.S.N.M. Plastron and carapace viewed from the lower side. Specimen from Melbourne, Brevard County, Florida. About ⅝ natural size.

O

CARAPACE OF TERRAPENE SINGLETONI, NEW SPECIES

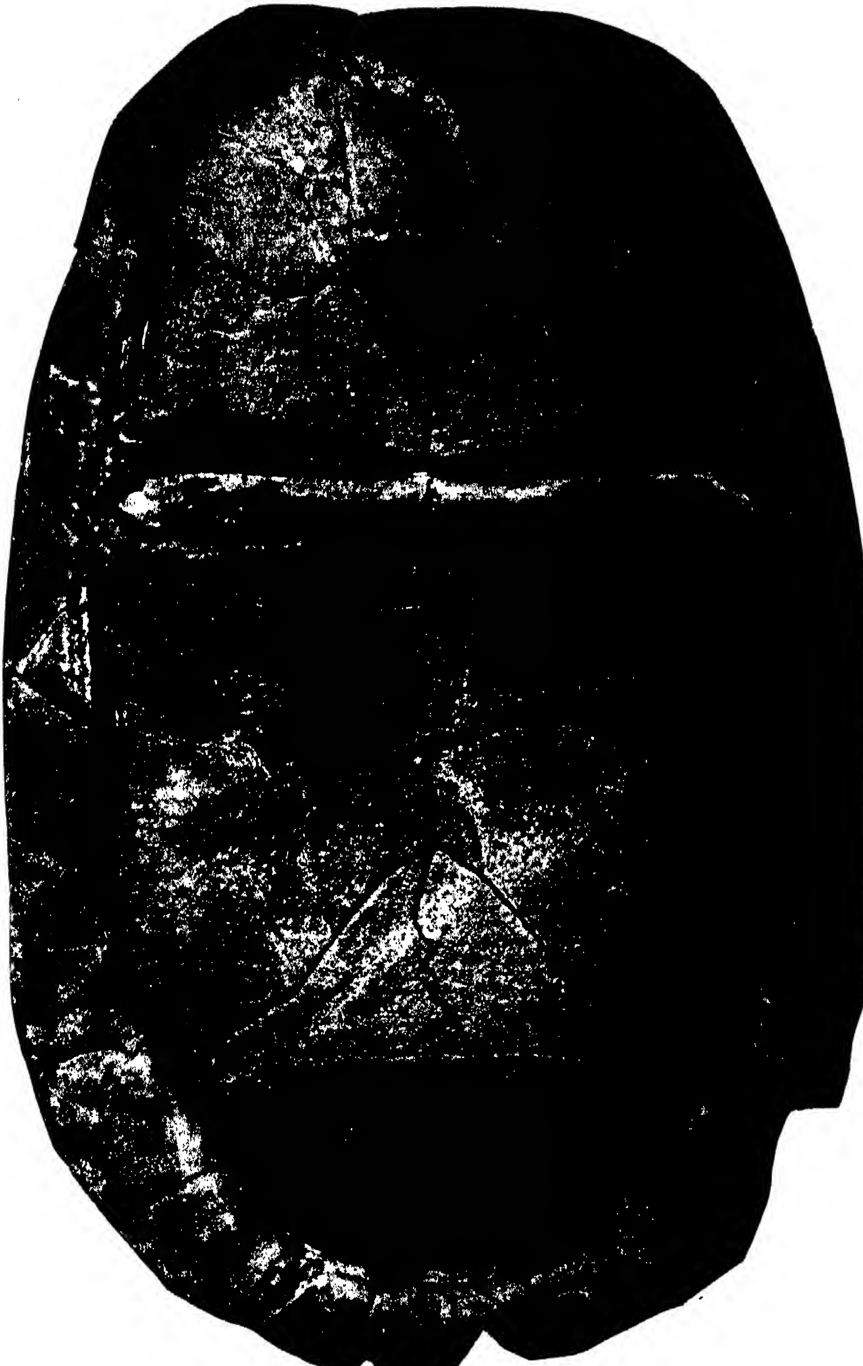
FOR EXPLANATION OF PLATE SEE PAGE 10

Carapace of Terrapene canaliculata Hay

CARAPACE OF TERRAPENE CANALICULATA HAY

CARAPACE OF TERRAPENE CANALICULATA HAY

FOR EXPLANATION OF PLATE SEE PAGE 10



Plastron of Terrapene canaliculata Hay

SOME PECULIAR FOSSIL FORMS FROM MARYLAND

By Wendell C. Mansfield,
Of the United States Geological Survey

The purpose of this paper is to call attention to some peculiar spiral, nearly straight, and irregular objects, probably representing the remains of fossil organisms, which were obtained from the low bluffs along the western shore of Chesapeake Bay, St. Marys County, Md.

In June, 1925, Dr. L. W. Stephenson collected four specimens of the spiral forms from the bluff about 6½ miles south of Cedar Point, one-third mile above the site of the old Langley homestead. As these specimens elicited considerable interest, the writer visited this locality and other localities in near-by bluffs during the following year.

STRATIGRAPHIC SECTIONS

In order to show the relationship of the bed in which these peculiar specimens occur to other beds outcropping in the bluffs, several stratigraphic sections are given below, and these are followed by brief descriptions of the included formations. The first bluff, Langleys Bluff, is about 25 feet high and one-third to half a mile long, and exhibits the section given below. Some parts of this section are obscured by a growth of vegetation.

Section No. 1, Langleys Bluff, about 5½ miles south of Cedar Point

	Feet
Pleistocene:	
5. Unfossiliferous cross-bedded buff sand and gravel with a water seepage along the base	4–15
4. Uniformly deposited unfossiliferous dark-gray sandy clay with a pebbly band at the base	2
3. Oyster zone—dark-colored sedimentary bed with inclusions of a few small pebbles. No unconformity was observed between this bed and the underlying one	0–1
2. Fossiliferous compact bluish sandy clay containing sandy pockets or filled borings. A thin oyster zone is at the base. In this bed are a few pebbles ranging up to 3 inches in diameter and smoothly water-worn cobbles, which are most abundant at the contact with the underlying Miocene	6–8
Unconformity.	
Miocene:	
1. Sandy clay with Miocene (St. Marys) fossils	0–3

Section No. 2, about three-fourths mile below section No. 1 and one-third mile above the site of the old Langley homestead. (Pl. 1, B.)

	Feet
Pleistocene:	
2. Rather stiff arenaceous clay, containing scattered pebbles. A layer of cobbles occupies a position 1 foot above the base	4
Probable unconformity.	
?Miocene, St. Marys (?) formation:	
1. Light gray to ferruginous argillaceous sand containing the following St. Marys forms, which are preserved as casts: *Turritella plebeia* Say, *Natica?*, *Cardium* species, *Tagelus?* *Spisula?*. Contains also the peculiar spiral and other forms described in this paper. The face of the bluff is uneven, due to protruding indurated sand	4

Section No. 3, about half a mile below section No. 2 and one-third mile below the site of the old Langley homestead

	Feet
Pleistocene:	
4. Sand and gravel. A layer of cobbles occupies a position in the lower part	4
Probable unconformity.	
?Miocene, St. Marys (?) formation:	
3. Unfossiliferous arenaceous clay	1½
Miocene, St. Marys formation:	
2. Sand carrying entire and fragmental St. Marys shells	1½
1. Bluish arenaceous clay carrying well-preserved St. Marys fossils	2½

In the above section the upper surface of bed No. 1 is somewhat irregular, suggesting a slight unconformity; however, no coarse sedimentary beds were found at the contact between beds Nos. 1 and 2 and these beds may be essentially conformable.

Section No. 4, about one-third mile below section No. 3

	Feet
Pleistocene:	
2. Dark clay, sand, and gravel. A layer of cobbles occupies a position near the middle of this bed	4
Probable unconformity.	
?Miocene, St. Marys(?) formation:	
1. Alternating seams of gray arenaceous clay and ferruginous medium-grained sand. Contains casts of *Pholas?* inclosed in a ferruginous matrix as well as the peculiar spiral, nearly straight, and irregular forms. The sandy seams are indurated and protrude from the face of the bluff	4

Section No. 5, about two-thirds mile below section No. 4

	Feet
Pleistocene:	
2. Dark-colored clay, sand, and gravel. A layer of cobbles occupies a position about 1 foot above the base	3½
Probable unconformity.	
?Miocene, St. Marys(?) formation:	
1. Alternating seams of gray argillaceous sand and ferruginous sand. The face of the bluff is irregular, due to the indurated sandy seams and cylindrical and oval indurated ferruginous concretions. Contains casts of the genus *Pholas?* inclosed in a gray to ferruginous semiindurated fine-grained argillaceous sand	4

As shown in sections 1 and 3, the Miocene bed carrying well preserved St. Marys fossils occupies the lower 3 or 4 feet of the exposures. In section 1 the fossiliferous Pleistocene bed rests unconformably upon the Miocene. (Pl. 1, A.) The age and the relationship of the bed containing both the peculiar spiral and uncoiled forms to the known Miocene are a little uncertain. No exposure was seen at which this bed is in direct contact with the Miocene bed carrying well preserved St. Marys fossils. However, it appears to correspond to bed No. 2 in section No. 3, a bed carrying entire and fragmental St. Marys shells. There is a possibility that the material composing the bed containing both the peculiar spiral and uncoiled forms has been reworked and that the contained casts of Miocene shells are stratigraphically out of place, the shells being carried in with sediments of Pleistocene age; but the material is finer grained than most of the Pleistocene material overlying the Miocene.

GENERAL STATEMENTS CONCERNING THE PECULIAR FOSSIL SPECIMENS

In position, the coiled forms stand upright in the deposit, while the uncoiled forms usually are horizontal. The specimens are coiled, nearly straight and branching, or somewhat irregular. The surface of the specimens is usually roughened by rounded or elongated elevations. In cross section the tube reveals two distinct parts. The outer or peripheral part is designated, for convenience, the wall, and the inner part, the core. The material composing the core consists of homogeneous, rather compact, fine-grained, ocherous, micaceous, noncalcareous sand. Prints of fossil mollusks were found in the walls of some specimens, but no organic remains were found in the cores. The inner part of the peripheral wall is porous.

Coiled specimens.—These specimens are either dextrally or sinistrally coiled. The upper part (so inferred) of the specimens is more regularly and symmetrically coiled than the lower. The diameter of the whorls of the coil in cross section in some specimens is nearly constant throughout, whereas in other specimens one end is larger than the other. The wall, in cross section, reveals under magnification fine quartz grains cemented by iron oxide. The material composing the core is similar to that of the wall except that it is less indurated and contains no trace of organic remains. No cellular structure was detected in the thin slides made from the cross sections of the wall.

Uncoiled specimens.—The uncoiled specimens occur in the same bed with the coiled specimens, but the coiled and uncoiled forms were not found attached, consequently the relationship of the two different forms has not been determined. In general they are stemlike in habit. Some are branching. Usually they are horizontally arranged in the bed. One cylindrical specimen possessing a much

thicker wall than common was found in a vertical position in bed No. 1, section 3, which carries well preserved St. Marys fossils. All specimens possess the peripheral wall and central core.

SUGGESTED RELATIONSHIP OF THE COILED SPECIMENS

In appearance the coiled specimens resemble *Daimonelix* [sometimes spelled *Daemonelix* by Barbour and other authors], a name proposed by Barbour[1] for gigantic spiral forms occurring in nonmarine deposits of northwestern Nebraska. According to O'Harra,[2] these peculiar forms occur in the so-called Harrison beds, of lower Miocene age, which form a part of the Arikaree formation. O'Harra[3] says:

> Among the interesting materials of the bad land deposits few have given rise to more speculations as to their origin than what are known as the Devil's Corkscrews of the Harrison beds. Devil's Corkscrews, or Daemonelix, as they are technically called, have been known by the early residents of northwestern Nebraska for many years, but it was not until 1891 when Professor Barbour made a collecting trip to Harrison and the bad lands that these strange objects were brought to the attention of scientific men. What they really represent or how they were formed is still a matter of conjecture. The more typical forms are upright tapering spirals and they twist to the right or to the left indiscriminately. The spiral sometimes encloses a cylindrical body known as the axis but it is more often without the axis. Sometimes the spiral ends abruptly below but more often there projects from the lower part one or two obliquely ascending bodies placed much as the rhizomes of certain plants. The size of the well developed form varies considerably. The height of the corkscrew portion often exceeds the height of a man while the rhizome portion is ordinarily about the size of one's body.
>
> They are known to occur especially between the headwaters of White and Niobrara Rivers chiefly in Sioux County, Nebr., but extend westward to Lusk, Wyo., and eastward to Eagle Nest Butte, S. Dak.* The vertical range of strata carrying them is approximately 200 feet. In certain localities they are found in the greatest profusion, sometimes stretching like a forest over many acres and sometimes so closely placed that they are inextricably entangled and fused together.
>
> Professor Barbour, who has given these interesting forms most study, considers them as representing some kind of plant life and has apparently found much to corroborate this view. Some have considered that they represent low plant organisms such as algae, others that they may be remains of higher plants, in which all has decayed away except the cortical layer. Still others, and these with much reason, have considered them as casts of well preserved burrows of animals. Among the earliest to suggest the latter idea were Dr. Theodore Fuchs, of Germany, and Professor Cope. More recently Mr. O. A. Peterson emphasized the latter view as a result of the finding of numerous fossils of burrowing rodents within the corkscrews.

The manner of coiling of the more regular forms of *Daimonelix* occurring in the "Harrison beds," as shown by the illustrations, and the coiled forms from Maryland is similar; but the latter are diminu-

[1] Barbour, E. H., Notice of new gigantic fossils: Science, vol. 19, pp. 99–100, 1892.
[2] O'Harra, C. C., S. Dak. School Mines Bull. No. 13, p. 44, 1920.
[3] Idem, pp. 59–61.

tive as compared with some of the gigantic specimens referred to *Daimonelix*. However, the origin and nature of the fossil specimens from the widely separated regions may be different. The "Harrison beds" are considered to be of nonmarine origin, whereas the bed carrying the spiral form in Maryland appears to be of marine origin.

In Europe, peculiar spiral forms or twisted structures have been known for a long time. In 1865, Dr. Oswald Heer[4] called attention to some remarkable spirally twisted structures (Schraubensteine) occurring in various parts of the Molasse, or Miocene, of Switzerland. These structures consist of rodlike bodies about as thick as one's finger, on the side of which are seated spirally twisted branches of equal thickness. The author states that these structures were probably the result of filled-in borings made by some species of Mactrina. In favor of this explanation the author writes that Prof. Carl Mayer found a *Lutraria sanna* Basterot in a specimen taken from a sandstone near the Martinsbruck, in St. Gall. The author also says, on the authority of Doctor Biedermann, that the "screwstones" are found in the uppermost layer of the lower fresh-water Molasse at the boundary of the marine Molasse, which has furnished the material for them.

In 1901, Ludwig von Ammon[5] described a peculiar spiral form under the name *Daemonhelix krameri* from the cyrena-bearing marl in Peissenberg, Germany. The coil of the fragment[6] measured 13 cm. in length and over 5 cm. in diameter. The greater diameter of the spiral whorl in cross section measured 20 mm. The specimen was obtained in a mine from a bed overlying the principal coal-bearing series. The illustration[7] shows a cast of a muscle shell embedded in a whorl and the intraspiral matrix of a *Daemonhelix* coil.

NEW GENUS PROPOSED

The writer has not formulated any particular theory to explain the origin of the coiled or uncoiled forms from Maryland. There is a suggestion that the central part or core was filled in after the outer wall had been formed. If these forms owe their origin to some organism, as they probably do, that of some marine plant, perhaps a fucoid, seems the more likely. The spiral forms are striking and interesting objects, and for convenience of reference it is desirable to name them. I therefore propose the generic name *Xenohelix* for the spiral forms and designate *Xenohelix marylandica* as the genotype.

[4] Die Urwelt der Schweiz, pp. 488, 489, fig. 326.

[5] Ueber das Vorkommen von "Steinschrauben" (Daemonhelix) in der oligocänen Molasse Oberbayerns, Geognostische Jahreshefte, Dreizehnter Jahrgang, 1900, pp. 55–69, figs. 4, 5, pl. 1, München.

[6] Idem, p. 68, fig. 4.

[7] Idem, p. 67, fig. 5.

XENOHELIX, new genus

XENOHELIX MARYLANDICA, new species

Plate 2, figs. 1–4

The specimen selected as the holotype is not entire, consisting of four remaining whorls. The diameter of the smaller end of the spire is more regularly and symmetrically coiled than the larger end, which suggests an irregularity in the habit of coiling. The surface is roughened by rounded or elongate elevations. The peripheral wall is thin, whereas the core is much thicker and constitutes the greater part of the tube. The character of the peripheral wall and core are as given under the description of coiled forms on page 3.

The measurements of the holotype in centimeters are: Length, 20.3; maximum diameter of larger end, 5, core of same end, 4; maximum diameter of smaller end, 3, core of same end, 2.1. Cat. No. 354137, U.S.N.M.

Type locality: Station 1/1049, low bluff on west shore of Chesapeake Bay, about 6½ miles south of Cedar Point and one-third mile above the site of the old Langley homestead, St. Marys County, Md. Bed No. 1 of section No. 2, page 2. L. W. Stephenson, collector.

The following bibliography of *Daimonelix* and other coiled forms has been prepared. Although this may be irrelevant to the subject of this paper, it will, however, serve as a reference to the literature on these very interesting forms referred to *Daimonelix*.

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EXPLANATION OF PLATES.

Plate 1.

A, Photograph of Langleys Bluff, St. Marys County, Md. The head of the hammer shows the contact between the Pleistocene deposit and the St. Marys formation. See p. 1, section No. 1, for description.

B, Photograph of a low bluff about one-third mile above the site of the old Langley homestead, St. Marys County, Md. A—A indicates the probable unconformity between the lower bed and the upper bed. The peculiar spiral and other forms came from the lower bed, occuring more abundantly in the lower part, as indicated by the head of the hammer. See p. 2, section No. 2, for description.

Plate 2.

Figs. 1-4, *Xenohelix marylandica* Mansfield. Type of new genus and species. Cat. No. 354137, U.S.N.M. p. 6.

1. Upright position of coil, about three-fourths natural size.
2. Cross section of peripheral wall cut from specimen No. 1, showing porous character of wall. (X 3.)
3. Photomicrograph of peripheral wall in cross section, cut from specimen No. 1. (X 3.)
4. Cross section of larger end of specimen No. 1, about natural size, showing peripheral wall and central core.

Plate 3

Figs. 1, 2. *Xenohelix marylandica* Mansfield. Topotypes. Cat. No. 354138, U.S.N.M. Slightly reduced.

3. Fragment in cross section of *Xenohelix marylandica*. *a*, Shows a cast of a bivalve shell imbedded in the inner margin of the peripheral wall. Slightly reduced.

Plate 4

Figs. 1, 3. Irregular, apparently branching form, taken from the same bed at the same locality as the type of *Xenohelix marylandica* Mansfield. Cat. No. 354139, U.S.N.M. Slightly reduced.

2. Longitudinal section of a nearly straight and tapering form, taken from the same bed and at the same locality as Figures 1 and 3. Horizontally placed in the bank. Cat. No. 354140, U.S.N.M. Slightly reduced.

PLATE 5

FIG. 1. Small, elongate, nearly cylindrical form associated with *Xenohelix marylandica* at the type locality. Cat. No. 354139, U.S.N.M. Slightly reduced.

2, 3. Fragment of nearly straight and cylindrical form taken from the upper part of bed No. 1 of section 3 (p. 2) of the St. Marys formation, about one-third mile below the site of the old Langley homestead. Cat. No. 354141, U.S.N.M. Slightly reduced.

2. Upright position of specimen.

3. Cross section of larger end of same specimen showing thick peripheral wall and central core.

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VIEWS AT AND BELOW LANGLEYS BLUFF, ST. MARYS COUNTY, MARYLAND

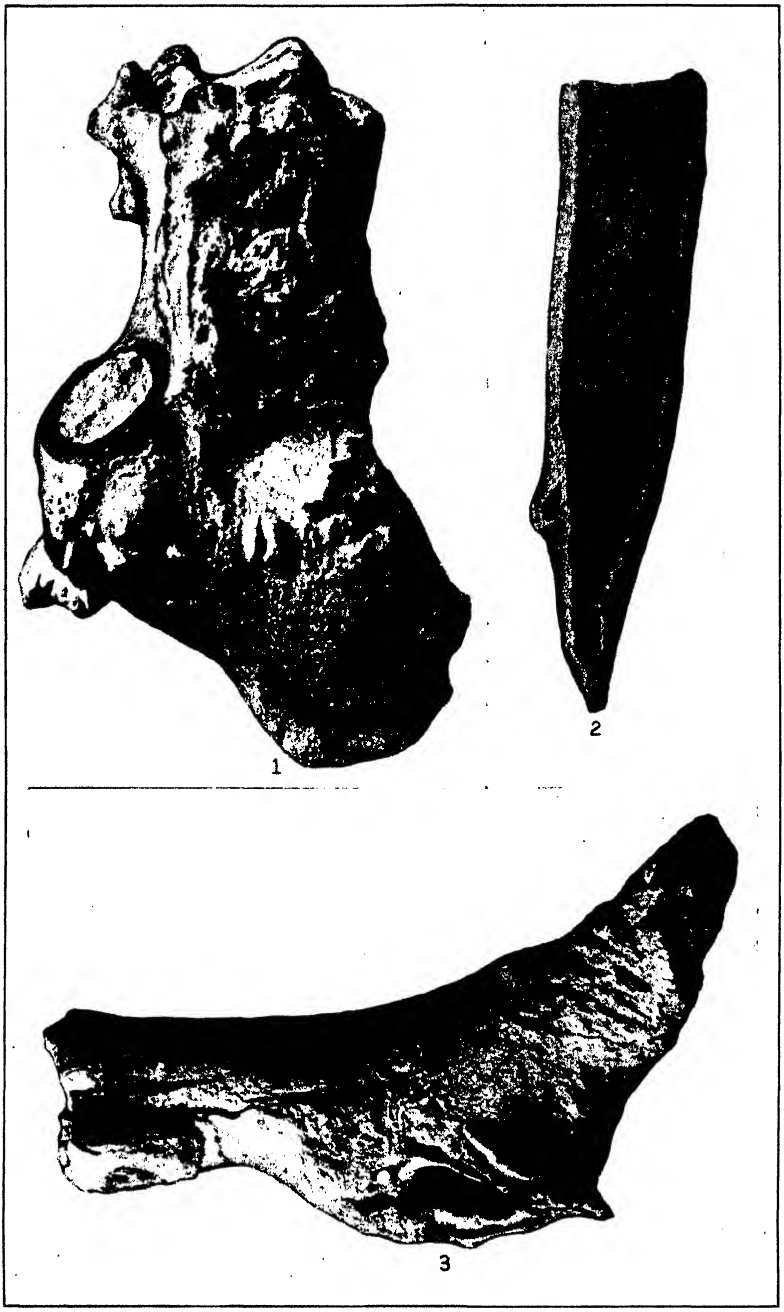
FOR EXPLANATION OF PLATE SEE PAGE 8

XENOHELIX MARYLANDICA MANSFIELD

FOR EXPLANATION OF PLATE SEE PAGE 8

XENOHELIX MARYLANDICA MANSFIELD

FOR EXPLANATION OF PLATE SEE PAGE 8



IRREGULAR FORMS ASSOCIATED WITH XENOHELIX MARYLANDICA MANSFIELD

FOR EXPLANATION OF PLATE SEE PAGE 8

1

2

3

CYLINDRICAL FORMS FROM BELOW LANGLEYS BLUFF

FOR EXPLANATION OF PLATE SEE PAGE 8

THE MASKELL SPECIES OF SCALE INSECTS OF THE SUBFAMILY ASTEROLECANIINAE

By Harold Morrison and Emily Morrison
Of the Bureau of Entomology, United States Department of Agriculture

INTRODUCTION

This paper presents the third completed set of results derived from the study of the collection of scale insects accumulated by Mr. W. M. Maskell of New Zealand during the years 1869 to 1897.[1]

The species considered here are those from the Maskell collection which are definitely assignable to some one of the genera now included in that section of the old subfamily Dactylopiinae which is currently designated as the subfamily Asterolecaniinae. As in previous work on this collection, a certain amount of confusion and misidentification has been discovered, and it has in consequence been necessary to discuss some species in addition to those actually described by Maskell, and to erect certain new species based on specimens confused with Maskell's species.

Only three of the species currently assigned to the group have been considered previously in connection with the study of the genotypes represented in the collection. One of these is *Frenchia casuarinae* Maskell, another is *Callococcus pulchellus* (Maskell), and the third is *Solenococcus fagi* (Maskell). Additional species in all of these genera are discussed in this paper.

In the absence of an even approximately adequate basic classification of the genera comprising the group, no attempt has been made in the following treatment of genera and species to arrange either in any systematic scheme, a simple alphabetical sequence being employed instead.

As with many other Maskell species, those considered here are often represented by poor or inadequate specimens, and it has consequently been impossible to discuss fully the details of the structure of some of them.

[1] An explanation of the developments which permitted the initiation of this work was given in Proceedings of the United States National Museum, vol. 60, art. 12, Ser. No. 2407, 1922, pp. 1 to 8, which was published on May 12, 1922. The second paper appeared as art. 17, Ser. No. 2468 in vol. 62 of the Proceedings of the United States National Museum, which was published on June 9, 1923.

Genus AMORPHOCOCCUS Green

In 1919, Prof. G. F. Ferris transferred to this genus a species which he believed represented Maskell's *Sphaerococcus leptospermi*. As has been pointed out in discussing the true *leptospermi* in this paper, Ferris's conclusions were based on a misidentification, and in consequence the insect discussed by him remains without a name. The available material representing it is very unsatisfactory, largely through injury by parasites, and the description given below is not entirely adequate. Following Professor Ferris, the species is left tentatively in the genus *Amorphococcus*, although there is a serious question as to the correctness of such placing, and it seems probable that the species will be found to be much more nearly related to the genus *Lecaniodiaspis*.

AMORPHOCOCCUS LEPTOSPERMI, new species

Plate 1, figs. 1–10

References.—Froggatt, N. S. Wales Dept. Agr., Sci. Bull. 19, 1921, p. 11 (as *Sphaerococcus leptospermi* Maskell).—Ferris, Can. Ent., vol. 50, 1919, p. 250 (as *Amorphococcus leptospermi* (Maskell)).

Adult female.—Forming a swollen twig gall as described and figured by Froggatt; exact shape and size of body uncertain, probably about 2.5 mm. long to 3 mm. long and stout elliptical; derm membranous to somewhat chitinized; antennae reduced to short 2-segmented stubs (Ferris says 3 to 4 segments), bearing several stout setae at tip of apical one; legs wanting; beak stout conical, 1-segmented; spiracles small, with bar enlarged at inner end, with a cluster of quinquelocular disk pores at opening, this continued as a loose band to another cluster at body margin, this last normally accompanied by two stout spiracular spines in the case of the anterior spiracles, one of these large, about 28μ long, one small, about 10μ long, these wanting with the posterior pair of spiracles; pores of posterior spiracular band not cleft to form two diverging arms; body, so far as can be determined, without definitely differentiated marginal setae; with some small setae dorsally and ventrally, no certain details of number, size, and arrangement determinable from the material examined; with some larger setae at posterior apex of body, including one pair of definitely differentiated apical ones; dorsum with small, but not minute, 8-shaped pores, with elongate tubular ducts and with minute circular simple pores scattered, apparently rather uniformly, but nowhere thickly, over the dorsal surface; with multilocular disk pores, normally with 10 loculi, in an uncertain number of transverse bands or rows in the posterior ventral abdominal area; with two longitudinal rows of tiny, irregularly rounded, cribriform plates, including from six to seven in each row;

anal region much as in *Lecaniodiaspis*, invaginated, with two pseudoplates, each somewhat wrinkled and bearing two small setae, about 8μ long, towards the posterior end; anal ring narrow, with a single row of pores and six setae, each about 58μ long; apical setae about 60μ long.

Larva (very poor embryonic only).—Shape uncertain; antennae 6-segmented, third and sixth nearly equal; legs not unusual; anterior spiracles with a single short broad spiracular spine at margin opposite each, this accompanied by a much smaller rounded spine; anal region much as in *Lecaniodiaspis* larvae, ring with six setae.

Holotype and paratypes.—Cat. No. 40358, U.S.N.M.

Described from a few imperfect examples received within their galls from Mr. W. W. Froggatt under his lot No. 24, collected by him on *Leptospermum laevigatum* (Myrtaceae) in New South Wales.

As indicated above, the actual affinities of this species seem to be with the genus *Lecaniodiaspis*, rather than with *Amorphococcus*, the only important morphological differences, so far as the species of the first genus have been studied, lying in the greater reduction of the antennae and in the smaller number of anal ring setae. The habit is, of course, quite different from that normal to *Lecaniodiaspis*. Pending critical study on the Asterolecanine genera, it has seemed best to refrain from an attempt to place this insect generically with any positiveness. From the available information, it appears to differ decidedly from the other two species, *mesuae* Green and *acaciae* Brain, now included in *Amorphococcus*.

Genus ASTEROLECANIUM Targioni-Tozetti

So few species in this genus were described by Maskell that no attempt has been made in this paper to do more than indicate the closest relatives of the species considered. From the complications that have developed from this limited study of the specimens included in the Maskell collection and of specimens supposed to represent certain of his species, received from other sources, it seems highly desirable that all obtainable material of at least the Australian species of the genus should be worked over critically.

ASTEROLECANIUM ACACIAE, new species

Plate 1, figs. 11–20

References.—Maskell, Trans. N. Z. Inst., vol. 27, for 1894, 1895, p. 63 (part).—Froggatt, Agr. Gaz. N. S. Wales, vol. 26, 1915, p. 759 (part).

Habit.—On twigs of the host; the test with a whitish fringe.

Adult female.—As mounted, practically circular, diameter 0.7 mm.; derm membranous; antennae reduced to small cones bearing two or three stout setae; legs wanting; spiracles small, each with a loose

band of multilocular disk pores running to margin; beak very short conical, 1-segmented; with a few short, stiff setae in the genital region, no others observed; 8-shaped pores in a fairly definite double row around body margin, except for a short distance at the posterior end; no large 8-shaped pores present dorsally, but with many very small ones distributed fairly uniformly; tubular ducts rather numerous, long but not conspicuous; apparently without quinquelocular disk pores, replaced at spiracles and along margin by small size multilocular disk pores, mostly with 10 loculi, but somewhat variable, a single row of these pores accompanying the marginal row of 8-shaped pores; with distinctly larger multilocular disk pores apparently in two transverse rows in the genital region; no minute simple pores observed; anal region not at all developed, the lobes not definitely formed, location indicated by a group of small setae, one larger, three somewhat smaller, one still smaller; anal ring represented by a small, cylindrical, somewhat chitinized tube, no definite ring, no ring setae, no chitinization of any sort.

No other stages available for description.

Described from two mounted specimens obtained from the Maskell collection, and, on the basis of his descriptive notes, collected at Sydney, New South Wales, on *Acacia* species. This material was a part of his lot No. 423, and was regarded by him as the species *ventruosum*.

Holotype and paratype.—Cat. No. 40359, U.S.N.M.

The actual relationships between this species and the other members of the genus *Asterolecanium* are not altogether certain. From their descriptions, it seems most closely related to *ceriferum* Green, *pudibundum* Green, and *spectabile* Newst.

ASTEROLECANIUM EPACRIDIS (Maskell)

Plate 2, fig. 1; Plate 27, fig. 1

Reference.—Fernald, Cat. Cocc. World, 1903, p. 50.

The Maskell collection contains three slides of this species, one of "Female, 2nd stage, from Leucopogon, Aug., 1881," the other of "Insects, 2nd and 3rd stages on leaves of Leucopogon, Sept., 1881," and one of "Young insect, from Leptospermum, Mar., 1884." Only a single unmounted specimen listed under No. 66 remains in the collection. The third or larval slide has been eliminated from consideration, as the correctness of its identification is open to question. The second slide is not a true microscopic mount and in consequence is of no value in a study of the structure of the species. There has been left for study only the first slide listed, and the condition of this is such that nothing more than a few notes on the structure could be obtained. It is not possible to state definitely

that this specimen is an adult female, although it is our impression, after examining it, that this is the case. The descriptive notes follow:

Female (second stage or adult).—External covering and appearance not noted (see Maskell's papers for notes on these); oval, very slightly narrowed behind; antennae of the usual minute size characteristic of the genus, legs wanting; 8-shaped pores present in a single continuous marginal row, this supplemented by similar pores distributed at intervals along and close to the marginal row and, in addition, by a loose cluster of three to six such pores above the spiracles on each side; marginal row of 8-shaped pores accompanied by a continuous row of small circular pores, these about half as numerous as the 8-shaped pores, the arrangement, in general, being an 8-shaped pore with a circular pore, then an 8-shaped pore without the circular pore, then another accompanied by a circular pore, and so on in alternation; presence or absence of abdominal multilocular disk pores not determined; anal lobes scarcely indicated; anal lobe seta between two and three times as long as the average anal ring seta; anal ring well developed, with six setae.

If it be assumed that Maskell's "2nd stage female" is actually an adult, as is believed, then this species may be fairly definitely placed in the genus as being related to *aureum* and *bambusae*, since the occasional submarginal 8-shaped pores are present, supplementing the marginal row, as in *aureum*, while there are only a few additional 8-shaped pores in the mid-dorsal region as in *bambusae*.

ASTEROLECANIUM STYPHELIAE (Maskell)

Plate 2, figs. 2–14; Plate 27, fig. 2

References.—Fernald, Cat. Cocc. World, 1903, p. 54.—Froggatt, Agr. Gaz. N. S. Wales, vol. 26, 1915, p. 759.—Green, Bull. Ent. Res., vol. 6, 1915, p. 48.

The Maskell collection contains eight slides of this species, one of "adult females and males in situ (Australia), 1891," one of "adult female (Australia), 1891," one of "adult female, 1892," one of "adult female, 1894," one of "2nd stage females, 1892," one of "males, 1891," one of "male pupa in test, 1893," and one of "larvae (Australia), 1891." None of these is really good. The unmounted material, placed under lot No. 218, evidently includes more than one lot of specimens, one of which represents a closely related but apparently distinct species. Additional examples, received from French and Froggatt, have been available for comparison.

Adult female.—See Maskell and Froggatt descriptions for characterization of test and other external details; fully distended body, as mounted, distinctly longer than broad, an average specimen 0.93 mm. long and 0.66 mm. wide, posterior end somewhat narrowed;

derm membranous; antennae reduced to small slightly protruding knobs, bearing three to five fairly evident setae at apex; legs wanting; spiracles with a slightly curved bar and a few, usually from four to eight, small quinquelocular disk pores between opening and margin; beak very short conical, 1-segmented; with an occasional tiny submarginal ventral seta, and a few small setae ventrally at the posterior end of the body in the genital region; no spiracular spines; 8-shaped pores of normal size in a single marginal row extending completely and continuously around the body excepting only for a small space adjacent to the anal lobes; with a fairly distinct ventral submarginal row of minute 8-shaped pores paralleling the marginal row, although distinctly separated, and with a few similar, but even smaller, pores scattered dorsally; tubular ducts evident, rather uniformly distributed, not very numerous nor crowded; with a row of quinquelocular disk pores, slightly more numerous than the 8-shaped pores, placed immediately below and accompanying the marginal row of 8-shaped pores for practically its whole length; with five definite midventral abdominal segmental rows of multilocular disk pores, each pore with around 10 loculi, and with a few pores on each side near the margin on the two or three segments anterior to these; tiny simple pores present dorsally, but very rare, one occurring at wide intervals in the submarginal region and a few over the dorsal area; anal lobes slightly protruding, each bearing a rather stout apical seta about 70μ long, and one or two much smaller setae below and one within, these about 7μ long; anal ring only very slightly invaginated, the inner faces of the lobes and a somewhat protruding collar above and below the ring chitinized; ventral face of each lobe with a definite elongate chitinized thickening of somewhat variable dimensions; anal ring well developed, with pores and six setae, each about $25\ \mu$ long.

Preadult female.—Closely resembling the adult in most particulars; shape about the same; with far fewer quinquelocular disk pores accompanying the marginal 8-shaped pores; no multilocular disk pores; presence of minute simple pores and of minute dorsal 8-shaped pores not certain; ventral submarginal row of minute 8-shaped pores developed, but the pores much less numerous than in adult; anal region practically identical.

Larva.—Elongate elliptical to slightly ovoid, narrowed behind, length as mounted 340μ, width 185μ; antennae 6-segmented; legs not unusual; spiracles not unusual, with one large quinquelocular disk pore at margin opposite each and a smaller one halfway between; with four to six fairly evident setae along anterior margin and a ventral submarginal row of minute setae on the abdomen, at least; 8-shaped pores in marginal and submedian rows on each half

of body as figured, but with only the one or two anterior pores of the intermediate rows developed; with a ventral submarginal row of very minute 8-shaped pores; anal setae about 55μ, inner seta of lobe about 9μ, anal ring seta about 11μ; inner face of anal lobes and a band around anal ring chitinized.

Cotype.—Cat. No. 40360, U.S.N.M.

The precise relationship of this species to the remaining members of the genus *Asterolecanium* is not certain. From the study made thus far it seems, superficially at least, to be most nearly related to such species as *miliaris* Boisduval, *delicatum* Green, and *masuii* Kuwana.

It is highly probable that some of the Australian collections assigned to this species actually represent really distinct, although closely related, species. The only records that can be regarded as unequivocal are those of collections from leaves of *Styphelia richei* from Victoria.

As already remarked, a portion of the Maskell material actually represents a distinct species which is characterized separately.

ASTEROLECANIUM TRANSVERSUM, new species

Plate 3, figs. 1, 4; Plate 27, fig. 8

Habit.—Living on the bark of the host.

Adult female.—Character of test and external appearance of insect not certain; body of fully distended adult, as mounted, slightly wider than long, length about 1 mm., width about 1.2 mm.; derm membranous; antennae reduced to short blunt cones, each with three to four setae at apex; legs wanting; spiracles not unusual, each with a row of quinquelocular disk pores running to margin, and normally including from 12 to 16 pores in each; beak very short conical, 1-segmented; with an occasional minute ventral submarginal seta, and with a few in the genital region, but no others observed on body; 8-shaped pores in a definite and conspicuous single marginal row interrupted only in the anal region; with a few very minute 8-shaped pores scattered on the dorsal surface and with a submarginal ventral row of similar pores, but these rather less definitely evident than in *styphelia*; with a single row of quinquelocular disk pores accompanying the marginal row of 8-shaped pores, closely approximating these in number, and, in contrast to the usual condition, with one or two quinquelocular pores extending beyond the 8-shaped pores at the posterior end; multilocular disk pores present on the ventral surface of the abdomen in six median transverse segmental rows, with one or two additional pores near the lateral margins of the segments anterior to those bearing the rows; tubular ducts not particularly numerous nor conspicuous, more abundant toward the

margin of the body; no tiny simple pores definitely observed; anal region very slightly protruding, anal lobes broad, hardly differentiated, inner faces somewhat chitinized, usually with a small ventral thickening; ring somewhat invaginated and with a narrow collar above; anal ring with pores and six setae, these about 32μ long; apical seta more than 50μ long, one moderately stout seta within apical seta about 10μ, and two slender ones below it about 6μ long.

Larva (Embryonic).—Very similar to that of *stypheliae*, but with the intermediate row of 8-shaped pores on each half of the body nearly or quite complete, instead of almost wholly lacking as in *stypheliae*.

Described from a very few mounted specimens taken from the Maskell collection material. The original collection source of these specimens is uncertain and could not be determined from Maskell's descriptive notes. It seems at least a possibility that these specimens may represent the Tasmanian material which Maskell assigned to the species *stypheliae*.

Holotype and paratypes.—Cat. No. 40361, U.S.N.M. Paratypes also in Maskell collection of Coccidae located with the New Zealand Department of Agriculture.

The species is evidently very closely related to *Asterolecanium stypheliae* Maskell. It appears to differ definitely in certain respects, including the distinctly broader test and body, the larger number of quinquelocular disk pores in each of the rows between spiracles and margin (from 12 to 17 instead of from 6 to 9), and in the reduction in the extent of the chitinization on the anal lobes.

ASTEROLECANIUM VENTRUOSUM (Maskell)

Plate 3, figs. 2, 3, 5–13; Plate 27, fig. 4

Reference.—Fernald, Cat. Cocc. World, 1903, p. 54.

The Maskell collection contains four slides labeled as this species, one of "3 adult females, 1894," one of "adult female, 1894," one of "test of female, 1894," and one of "larva, 1894." The larva is quite plainly an Eriococcine form, and consequently can be given no further consideration. The remaining slides are in fair condition, so that it has been possible to check them against mounts which have been made from the unmounted specimens included in the collection under No. 423. Two species are very evidently present of which that described by Maskell as being on dark red bark and having a test with pinkish fringe, since it is mentioned first, is to be taken as the true *ventruosum* and the specimens from such bark as the type specimens. The description which follows is restricted to these specimens.

Adult female.—See Maskell publications for description of test and other points in the external appearance; body, as mounted, ap-

proximately circular, diameter 0.7 mm.; the anal region very slightly protruding; body entirely membranous except, as described later, in the anal region; antennae represented by flat conical stubs, each with a lateral, acute tip, and a central clear area bearing two pores and a single stout tapering seta; legs wanting; spiracles stout, somewhat kidney-shaped, each with a single row of tiny quinquelocular pores between it and margin; mouth parts not unusual, the segmentation of the beak obscured; with an occasional marginal, or perhaps ventral submarginal, slender seta, these more evident near the posterior apex of the body, and with segmental pairs of larger, stouter setae ventrally anterior to the anal region; large 8-shaped pores in a double row of alternating pores for about five-sixths of the circumference, the remainder near the anal region, in a single row terminating on each side somewhat before the apical seta; no other 8-shaped pores of comparable size present, but the dorsal surface with a very considerable number of minute 8-shaped pores, each not more than one-fourth the length of a similar marginal pore, scattered, apparently uniformly, over the surface, ventrally with a submarginal row of scattered minute 8-shaped pores of modified shape, shorter oval and less distinctly bilocular; quinquelocular pores represented by a marginal row, accompanying the 8-shaped band and, in general, nearly as numerous as the combined rows of 8-shaped pores anteriorly but about half as numerous near the posterior apex of the body, by a single to double row of scattered pores between each spiracle and margin, and by two or three just anterior to each antenna; multilocular disk pores each with 9–11 loculi in seven transverse, apparently segmental rows in the ventral abdominal region, the pores in the posterior rows closely placed, those in the anterior rows much more scattered; with a marginal row of minute, circular, apparently simple, disk pores immediately below the row of quinqueloculars and somewhat less abundant than these; relatively large tubular ducts present, rather numerous, distributed nearly uniformly through the dorsal area; anal area slightly protruding, the lobes not differentiated, anal seta stout, about 165μ long, with a stiff seta about 7.5μ long immediately beneath and another about 6μ long within at the opening of the short, distinctly chitinized, invaginated tube surrounding the anal ring; this last well developed for the genus, with pores and six setae, the longest about 28μ.

No other stages available from the type material.

Cotype.—Cat. No. 40362, U.S.N.M.

As with the other Maskell species of *Asterolecanium*, an accurate location of this species within the genus is not practicable at this time. From descriptions it seems probable that it is rather closely related to *A. tokyonis* Kuwana.

Genus CALLOCOCCUS Ferris

References.—Ferris, Can. Ent., vol. 50, 1918, p. 328.—Morrison and Morrison, Proc. U. S. Nat. Mus., vol. 60, art. 12, 1922, p. 32.

As a consequence of the present study on the Maskell collection of Coccidae, the writers have been successful in removing two more species from Maskell's scrap-bag genus *Sphaerococcus*, and in attaching them, tentatively, at least, to this already described genus in the subfamily Asterolecaniinae. These two are the *Sphaerococcus acaciae* of Maskell and the *Sphaerococcus leptospermi* of Maskell. In habit characteristics these two differ widely from the genotype and from one another, but they appear to have much the same general morphological characteristics, possessing as they all do a definite median longitudinal dorsal compound pore band running from antennae to anal ring. The inclusion of these two additional species makes desirable some modification of the generic diagnosis previously given by the writers for *Callococcus* (reference cited), and a revised diagnosis is accordingly given below:

Asterolecanine coccids with adult female with varying habit characteristics, inclosed in a waxy test, covered by a mass of white cottony secretion, or forming a swollen twig gall; body a sac, stout to elongate-elliptical in outline; derm membranous or more or less chitinized in the median dorsal area; antennae reduced to short stubs or to flat plates; legs wanting; beak short conical, 1-segmented; spiracles with short wide bar and a few quinquelocular disk pores adjacent; derm pore types including bilocular 8-shaped pores, all of small size, quinquelocular disk pores, possibly some pores with a greater number of loculi, tubular ducts with cup-shaped inner ends, and sometimes, at least, minute circular, apparently simple disk pores, the arrangement of these various, but a dorsal median longitudinal compound band, made up of two or more of these types and running from antennae to anal ring, characteristic of the genus; body with short stiff setae, these never numerous nor conspicuous, not differentiated into marginal, spiracular, dorsal and ventral types; anal region wholly undeveloped, the anal ring a small, simple collar placed ventrally some distance from the nominal posterior body margin; apical setae somewhat larger than remainder, placed between ring and margin.

Assumed second stage female elongate ovate; derm membranous; antennae stout, strongly tapering from base to apex, 6-segmented; legs stout and short, claw long slender or short and stout; beak stout conical, 1-segmented; derm with dorsal, ventral and marginal rows of setae; no spiracular spines differentiated; derm without pores other than the quinquelocular disk pores adjacent to the spiracles, or

with tubular ducts; anal region very slightly developed, the ring a simple collar with short internal tube, apical setae somewhat differentiated.

Larva dimorphic, normal form elliptical; antennae 4 to 6 segmented; legs normal; beak short conical, 1-segmented; spiracles not unusual, accompanied by one or more quinquelocular disk pores, 8-shaped pores in a marginal only or marginal and incomplete intermediate rows, no submedian row; no other pore types developed; anal region practically undeveloped, anal ring a small simple collar, apical seta differentiated, short or long; dimorphic form quite similar to that stage here regarded as second stage female.

CALLOCOCCUS ACACIAE (Maskell)

Plate 4, figs. 1–10; Plate 5, figs. 1–9; Plate 27, fig. 5

Reference.—Fernald, Cat. Cocc. World, 1903, p. 85.

The Maskell collection possesses five slides of this species, one of "female with larvae, 1892," two of "adult female, 1892," one of "2nd stage females and larva, 1892," and one of "larva, 1892." None of these is particularly good. There are also several unmounted specimens, attached to the host twigs, under No. 282. Additional specimens, apparently representing this species, collected in New South Wales by Mr. George Compere, have also been examined.

Adult female.—External appearance and secretion as described by Maskell, and as figured here; body as mounted very broadly elliptical, length about 2.7 mm., width about 2.5 mm.; derm membranous or faintly chitinized and indistinctly areolate over the mid-dorsal area at maturity; antennae represented by flat or very slightly protruding plates, each normally bearing three or four stout setae and one or two pores; legs lacking; spiracles stout, with short broad bar but only a few (around half a dozen) quinquelocular disk pores near opening; beak uncertain; body setae chiefly, and perhaps wholly, confined to the limits of the pore band, not conspicuous, stiff, around 10μ long, the two probably corresponding to the apical setae about 18μ long; no differentiated marginal setae; no spiracular spines; 8-shaped pores, so far as observed, restricted to the median longitudinal dorsal pore band, in this species much broadened and occupying fully a third of the dorsal area, and to a few in the region of the genital opening ventrally, small but numerous, with a fairly thick wall and a delicate internal tube from the middle; tubular ducts, with cylindrical tube showing, under some conditions, a fluted wall and a quinquelocular appearance from the end view, and normal small quinquelocular pores intermingled with the 8-shaped pores to form the pore band, probably in definite pattern, but this not certainly determinable from the material examined; some other

tubular ducts, with delicate tubes and very long slender prolongations scattered elsewhere on the body; no multilocular disk pores, other than the quinqueloculars, observed; no tiny circular simple pores observed; anal region as in other species of *Callococcus*, the ring a small simple band placed ventrally, no lobes, their location suggested only by two larger setae, accompanied by several small ones.

Second stage female (assumed).—Body elongate ovate, somewhat broader before the middle, length of mounted specimen about 0.68 mm., width about 0.29 mm.; derm membranous; antennae short conical, broad at base but 6-segmented, the preapical with one, the apical with several short stout sensory setae; legs short and rather stout, the coxae of each pair widely separated, tibia and tarsus only incompletely separated, claw long and slender, slightly curved, claw digitules slender, much shorter than claw; spiracles fairly stout, with two or three quinquelocular disk pores adjacent to opening of each; beak short, stout conical; marginal setae not differentiated; no spiracular spines; with transverse segmental rows of rather elongate (about 11μ) setae dorsally and with corresponding ventral rows of smaller, more slender setae; no 8-shaped pores observed; with transverse segmental rows of elongate tubular ducts; with no multilocular disk pores, and with quinqueloculars only adjacent to the spiracles; no tiny circular simple pores observed; anal region poorly developed, lobes not protruding, apical seta about 22μ long; anal ring simple, small, with short internal tube attached.

Larva (normal form).—Elliptical, length as mounted about 340μ, width about 150μ; derm membranous; antennae rather stout but not tapering strongly, 6-segmented, the two apical with stouter sensory setae; legs normal in size, claw long, slender, slightly curved, claw digitules slender, slightly knobbed at apices, surpassing apex of claw; beak short conical, 1-segmented, with a double row of small marginal setae and with one or two other rows dorsally and ventrally; with several setae on the very slightly developed anal lobes, the apical very long, as much as 180μ; 8-shaped pores rather deeply invaginated, in marginal and incomplete intermediate rows dorsally on each half of body, no submedian row present; a small quinquelocular disk pore adjacent to the opening of each spiracle; no other pore types observed; anal ring poorly developed, with a faint short tube attached internally, opening not quite apical. (Dimorphic form).—Closely resembling the second stage female, already described, but smaller, and lacking the tubular ducts present in that stage.

Cotype.—Cat. No. 40363, U.S.N.M.

This species digresses widely from the other two now included in the genus *Callococcus* in its habit characteristics, having, as it does,

a mass of white cottony secretion thickly covering and concealing it, while *pulchellus*, the genotype, has a definitely formed ribbed test, and the other species here assigned to this genus, *leptospermi*, is much larger in size and forms a conspicuous twig swelling, within which it lives. Morphologically the species is distinguished from *leptospermi* by the lack of minute simple pores in the dorsal band, as well as by the difference in size. From *pulchellus* it is distinguished by the broad, relatively very lightly chitinized dorsal pore band, a structure which in *pulchellus* is almost linear, except where tripled, and usually heavily chitinized.

CALLOCOCCUS LEPTOSPERMI (Maskell)

Plate 5, figs. 10–13; Plate 6, figs. 1–8; Plate 27, fig. 6

References.—Fernald, Cat. Cocc. World, 1903, p. 86.—Froggatt, N. S. Wales, Dept. Agr. Sci. Bull. 19, 1921, p. 11 (part).

The Maskell collection includes eight slides of this species, one of "female before gestation, 1893," one of "female at gestation, 1893," one of "female after gestation, 1893," one of "male pupa, 1893," one of "male, 1893," one of "males, 1893," one of "late larva, 1893," and one of "early larvae, 1893." None of these slides is at all satisfactory. There are some galls of the species under lot No. 301 and a male glued to a rectangle of black cardboard. Specimens identified as this species, received directly from Mr. Froggatt, have also been available for comparison, but these represent another species, so the descriptive notes that follow have been taken from the Maskell specimens.

Adult female.—External appearance and habit as described by Maskell; elliptical, size varying, specimen examined 9 mm. long by 6 mm. wide as mounted; derm membranous, or possibly more or less irregularly lightly chitinized at maturity; antennae reduced to unsegmented nearly cylindrical tubercles, slightly invaginated and bearing two or three stout setae at apex; legs lacking; beak small, short conical, segmentation uncertain; spiracles stout, with short, broad, somewhat expanded bar, with a cluster of small quinquelocular pores around the opening of each; without definitely differentiated marginal setae; without spiracular spines; with small stiff setae widely scattered both dorsally and ventrally, largest, except for some probably corresponding to the anal lobe setae, in the mid-dorsal line, precise arrangement not at all certain; 8-shaped pores all much modified, small, sometimes with three loculi in line, usually with heavy outer wall, apparently confined to a broad median longitudinal band or stripe running the full length of the dorsal surface and continued onto the ventral surface at each end, this band, made

up of pores of three sorts, corresponding closely in position and in general composition to that found in the genotype, *pulchellus*, although differing in details; tubular ducts, so far as can be determined, of one sort only, small, rather short, somewhat swollen at inner end and with deep asymmetrical cup, widely scattered over dorsal and lateral surfaces of body, and to an uncertain extent ventrally, but apparently wholly excluded from the dorsal longitudinal pore band; derm with small quinquelocular disk pores around spiracular openings as described, and with larger similar pores dorsally in two loose rows forming the borders of the longitudinal pore band; ventral surface anterior to anal ring with transverse rows of scattered small disk pores, each with a definite quinquelocular center surrounded by a band possibly, but, from the material at hand, not certainly containing small loculi in uncertain numbers, possibly around 10; no cribriform plates; with a rather dense cluster of very tiny, apparently simple, pores through the middle section, or the area a little behind the middle, of the dorsal longitudinal pore band, the numbers gradually decreasing anterior and posterior to the densest portion; anal region practically obliterated, no traces of lobes or of chitinization; anal ring placed ventrally, well anterior to the apical margin in mounted specimens, reduced to nothing more than a relatively minute chitinized collar; a few larger stouter setae between ring and posterior margin of body, one pair in particular, each about 10μ long, probably representing the apical setae.

No other stages available, except very poor embryonic larvae not suitable for description.

Cotype.—Cat. No. 40364, U.S.N.M.

This species is readily differentiated from the two others now placed in *Callococcus* by its gall-making habit, by its large size, and by the presence of a dense cluster of minute simple pores in the middle section of the dorsal pore band. Forming, as it does, gall swellings in the twigs of the host, it has very little resemblance to either the genotype with its definitely formed waxy test or the other included species *acaciae* with its dense mass of white cottony secretion.

It is necessary to call particular attention to the fact that this insect, as described by Maskell, is not identical with the *Sphaerococcus leptospermi* sent out by Mr. W. W. Froggatt to various coccidologists and redescribed by Prof. G. F. Ferris in 1919.[2] This insect, as pointed out by Professor Ferris, may perhaps agree sufficiently with Mr. Green's genus *Amorphococcus* so that it may be placed in it. As it is at present without a name it is described briefly and named as new elsewhere in this paper.

[2] Can. Ent. Vol. 50, 1919, p. 250.

Genus CEROCOCCUS Comstock

No attempt is made in the following discussion of the Maskell species that have been placed in this genus to indicate critically their relationships to the remainder of the species assigned to *Cerococcus* nor their relation to the genotype, *Cerococcus quercus* Comstock. Some examinations of supposedly congeneric species have been made but no critical conclusions have been reached.

Certain of the species now included here have had somewhat varied careers. *C. bryoides* and *C. stellata*, for example, were originally placed in *Asterolecanium* (actually in *Planchonia*). Even more curious was the assignment of *C. paradoxus* and *C. indicus*, which Maskell regarded as anomalous members of the genus *Eriococcus*. The incorrectness of this placing was first noted by Mr. E. E. Green, who correctly demonstrated their relationship to the oriental and Australasian species of *Cerococcus*.[3]

CEROCOCCUS BRYOIDES (Maskell)

Plate 7, figs. 1–15; Plate 8, figs. 1–8; Plate 28, fig. 1

References.—Fernald, Cat. Cocc. World, 1903, p. 58.—Froggatt, Agr. Gaz. N.S.Wales, vol. 26, 1915, p. 1056.

The Maskell collection includes four slides of this species, one of "adult female, 1893," one of "spinnerets and anal tubercles, 1893," one of "larvae after hatching, 1893," and one of "larvae, embryonic, 1893." These are all rather poor. From the unmounted material, included under No. 338, a single adult female has been secured. The limited Maskell material has been supplemented in the following description by several mounted specimens, collected in Fiji by Mr. Albert Koebele and by Mr. George Compere.

Adult female.—Test as described by Maskell, body as mounted practically as wide as long, with the posterior extremity protruding, total length about 1.9 mm., width, 1.8 mm.; derm membranous throughout, excepting inner faces of anal lobes and the small disks bearing the cribriform plates; antennae reduced to small unsegmented tubercles, slightly invaginated and bearing several stout sensory setae apically; legs lacking; spiracles with broad but only faintly chitinized bar, a narrow median section heavily chitinized; beak short conical, incompletely 2-segmented; no spiracular spines, marginal setae, as such, not evident, derm with an occasional minute seta dorsally and ventrally, these largest, but still quite small, ventrally in the region of the genital opening; 8-shaped pores numerous and conspicuous over the dorsal surface, in two distinct sizes, the larger with a maximum largest dimension of about 21μ, the smaller

[3] Green, Journ. Econ. Biol., vol. 5, 1910, p. 5.

with a long dimension of about 10μ, but both sorts varying somewhat in size, the larger continued on to the ventral face of the body opposite the spiracles, and arranged in a fairly definite pattern dorsally, although one rather difficult to describe but usually with an interrupted and incomplete row of large pores, each placed transversely, along the median line in the mid-dorsal area, and on each side of this large whorls or circular bands composed of large and small pores intermingled, each with its long axis at a right angle to the radius of an imaginary circle, outside of these circles, near and at body margin, with numbers of large and small 8-shaped pores irregularly disposed; ventral abdominal surface in genital region without circular loculate disk pores, but with small 8-shaped pores in transverse bands; tubular ducts rather numerous and widely distributed, but small and much less conspicuous than the 8-shaped pores; with a small cluster of tiny multilocular disk pores near each antenna and additional similar pores scattered over the ventral surface, and with a single row of quinquelocular disk pores running from each anterior spiracle to margin, and a cleft row, with the ends widely separated, from each posterior spiracle, the pores at inner end of each row definitely smaller than those at outer end; cribriform plates small, very roughly circular, set in small chitinized plates, often double, arranged in two paired groups, the anterior group on each side usually limited to two plates, the posterior comprising from two to four such plates, with three the number most frequently present; minute simple pores not certainly observed; anal lobes well developed, stout conical, each bearing an apical seta about 180μ long, two stout, curved, spinelike setae on inner face, the larger about 32μ, and three much smaller, short slender setae on outer face, outer margin of each lobe thickened below, inner face thickened and lightly but fairly distinctly irregularly areolate; anal ring with pores and eight setae, each about 80μ long; cauda short tapering, broadly rounded at tip and bearing one to several tiny teeth along margin of outer half.

Intermediate female.—Not available.

Larva.—Body, as mounted, elongated ovoid, broader before the middle, length about 360μ, width about 180μ; antennae 6-segmented, total length around 107μ, slightly enlarged apically, third segment longest; legs not unusual, claw with denticle, both claw and tarsal digitules knobbed and exceeding claw tip; beak short conical, incompletely 2-segmented; spiracles not unusual, each with a single quinquelocular disk pore at opening and the anterior with one, the posterior with two well-separated quinquelocular pores at margin opposite the spiracle; marginal setae small and inconspicuous, alternating with the marginal 8-shaped pores, no spiracular spines; dor-

sal and ventral surface setae few, small, not conspicuous, a cluster of larger setae between the antennal bases ventrally; 8-shaped pores conspicuous, in complete submedian and marginal and a posteriorly incomplete intermediate row dorsally on each half of body, the pores in the submedian row the largest; no tubular ducts; no tiny simple pores observed; anal lobes only slightly protruding, apical seta as much as 160μ long, each lobe chitinized on inner and ventral faces, bearing two stout, somewhat curved setae on inner face and two small slender ones on outer upper face; anal ring with a single row of pores and six setae, each around 82μ, and with a pair of shorter setae immediately below the ring; cauda very short, much broader than long, the margin very broadly rounded or almost truncate.

Cotype.—Cat. No. 40365, U.S.N.M.

CEROCOCCUS FROGGATTI, new species

Plate 9, figs. 1–11

Reference.—Froggatt, Agr. Gaz. N. S. Wales, vol. 26, 1915, p. 1056.

From an extended comparison between the single adult female of *stellatus* available from Maskell's type material and a few specimens of a species of *Cerococcus* identified as *stellatus*, received from Mr. W. W. Froggatt, the conclusion has been reached that the latter specimens can be distinguished from Maskell's species by a few small differences that appear to be definite, on the basis of the very limited material studied. Even if the two are actually definitely proven to be distinct when an extended series of each has been studied, their very close relationship is a fact that should be particularly emphasized.

Adult female.—Test as described by Froggatt (reference cited). Very similar to *C. stellatus* (Maskell), no apparent definite differences in most structures, pore pattern seemingly identical, differing definitely, so far as has been determined, in that the ventral transverse rows of 8-shaped pores at the apex of the abdomen adjacent to the genital opening are accompanied by a few scattered multilocular disk pores of fair size, each with around seven to eight loculi and usually with bilocular center, in contrast to the apparent complete lack of such pores in *stellatus;* and in the occurrence of few quinquelocular disk pores in the bands running from the anterior spiracles to margin, the number in this form apparently not exceeding 90, in contrast to around 115 in *stellatus.*

Larva.—Very similar to that of *stellatus* in most details, but seemingly offering an even more conspicuous differentiating character than is exhibited by the adults: the cauda in *stellatus*, as described, relatively long and strongly protruding, with rounded apex; in this

species merely a rather narrow thickened band bearing one or two denticulae on each side.

This species has been characterized from a few mounted and unmounted examples received from Mr. W. W. Froggatt under his No. 91, and collected by him at Mittagong, New South Wales, on stems of *Helichrysum diosmifolium* (Compositae).

Holotype and paratypes.—Cat. No. 40366, U.S.N.M.

CEROCOCCUS INDICUS (Maskell)

Plate 28, fig. 2

References.—Fernald, Cat. Cocc. World, 1903, p. 77.—Green, Journ. Econ. Biol., vol. 5, 1910, p. 5 (as new).

The Maskell collection contains a single slide of this species, of "adult female, 1896" in fair condition and a few unmounted specimens on the host under lot No. 508. Specimens from the material on which Mr. Green based his description have also been available.

As Mr. Green's figures (reference cited) are quite satisfactory, no attempt is made in this paper to illustrate the species. Some additions to Green's detailed description are given below.

Adult female.—Fully distended, mounted adult female about 2 mm. in diameter, excluding the protruding apical portion of the abdomen; antennae unsegmented cones, the apex not invaginated; pores in spiracular to margin bands normally quinquelocular, not simple, the anterior bands with around 60 pores in each, the posterior bands split, with diverging halves as already described for *bryoides;* beak stout conical, 2-segmented; typical number of cribriform plates two in each anterior group and four in each posterior group; with a few multilocular disk pores scattered in the posterior ventral region, but no lateral clusters of these; inner and ventral faces of anal lobes with chitinized areas, the inner distinctly large areolate.

No stages other than adult female have been available.

Cotype.—Cat. No. 40367, U.S.N.M.

The procedure adopted by Mr. Green (reference cited) of regarding this form as an undescribed species does not appear to accord with the established rules of zoological nomenclature, and if these are followed, Maskell, as the first publisher of a name for this insect, must be credited with the authorship of the species.

This insect is separable from Maskell's Australian and Fijian species by several characters; none of the species from these regions that have been examined has more than a single pair of clusters of cribriform plates while this has two pairs of such clusters; the presence of rudimentary legs also serves to distinguish it from *bryoides*, and the split posterior spiracular pore bands from *paradoxus*. It approaches *stellatus* and *froggatti* most closely, but these,

in addition to possessing a single pair of cribriform plate clusters, have the dorsal whorls of 8-shaped pores less pronounced and have a larger number of quinquelocular pores in the anterior spiracular bands.

Green regards *hibisci* as its closest relative. His careful and elaborately illustrated work on the Ceylon species and his work on the other Indian species should supply a basis for separating *indicus* from the other species of the Oriental region.

CEROCOCCUS PARADOXUS (Maskell)

Plate 10, figs. 1–13; Plate 11, figs. 1–8; Plate 28, fig. 3

References.—Fernald, Cat. Cocc. World, 1903, p. 77.—Green, Journ. Econ. Biol., vol. 5, 1910, p. 51.—*Cerococcus auranticus* Froggatt, Agr. Gaz. N. S. Wales, vol. 26, 1915, p. 1055.

The Maskell collection includes four slides of this species, two of "adult female, 1895," and two of "adult female, 1896," all in fairly good condition. The unmounted specimens, placed under No. 68, include a few on a cardboard square and a number on a portion of the host plant. Supplementary mounts have been obtained from this material, and it is largely from these that the following redescription has been prepared.

Adult female.—Test and body as described by Maskell and Froggatt; body of mature female, as mounted, nearly circular, except for protruding apex of abdomen, maximum length 2.2 mm., width 1.9 mm.; early adults smaller and distinctly longer than wide; derm membranous; antennae reduced to fairly elongate, incompletely 2-segmented tubercles, hardly invaginated at apices, but with several stout apical setae; middle and hind legs represented by stout curved spines set on flattened bases, but fore legs with only somewhat enlarged bases; spiracles stout, each with a relatively heavy band of quinquelocular pores (more than 200) running from spiracle to margin, those forming the posterior bands not split into two groups as in many other species; beak stout conical, incompletely 2-segmented; marginal setae, as such, apparently not developed; no spiracular spines; dorsal and ventral derm setae small and inconspicuous, those placed ventrally in the genital region somewhat larger and more evident; 8-shaped pores numerous, in two distinct sizes, the larger having a maximum long dimension of about 22μ, the smaller size with a long dimension of 15μ or less, the larger pores confined to an elongate cluster on each margin of the protruding posterior portion of the abdomen, and to clusters on each side of the bands of quinquelocular pores running from spiracles to margin, plus an occasional pore in or near the posterior mid-dorsal area; smaller 8-shaped pores widely distributed, showing to some extent

in the mid-dorsal area the circular arrangement so conspicuous a part of the pore design in some other species; quinquelocular disk pores present in four heavy bands between spiracles and margin, as already described, in small clusters near antennae and scattered widely over the ventral body surface; multilocular disk pores, usually with multiloculate centers present anterior to the genital opening in at least two or three transverse segmental rows of widely separated pores, each row ending in a small cluster of pores; tubular ducts quite numerous, but slender and not at all conspicuous; cribriform plates in two clusters only, each including two or, less frequently, three small, roughly circular plates, each set in protruding chitinized rim; no tiny simple pores observed; anal lobes well developed, tapering, often obscured through the retraction of the extreme apex of the body, the ventral and inner faces more or less chitinized, this area on the inner face large areolate, apical seta rather stout, about 150μ long, the two stout curved setae on upper face fairly elongate, about 36μ; cauda tapering rather strongly, about 55μ long by 70μ wide, apex rounded; anal ring with a single row of pores and eight setae, each about 83μ long.

Intermediate female.—Not available.

Larva.—Very similar to this stage of other species; length as mounted about 420μ, width about 200μ; antennae 6-segmented, the third longest; legs not unusual; beak short conical, fairly distinctly 2-segmented; marginal setae small, slender; no spiracular spines; 8-shaped pores large, in the usual two complete and one incomplete rows on each half of the dorsal surface; apical setae of the slightly protruding anal lobes about 215μ long, cauda fairly strongly protruding, with rounded posterior margin; anal ring with a single row of pores and six setae, each about 32μ long.

Specimens of the species *aurantiicus* Froggatt, sent by Mr. Froggatt to the United States Bureau of Entomology, have been compared with slides of Maskell's *paradoxus*, but no basis for separating the two on morphological characters has been discovered and they are here regarded as identical.

It should be noted that no original actual type Maskell slides were represented in the collection and there is therefore no absolute assurance that specimens from the type material have been examined at all. From his description and from other circumstances it seems reasonably certain that the species redescribed here is actually the *paradoxus* of Maskell.

The closest relative is the species *punctuliferus* Green, found on the same plant host. The two apparently differ in one respect only: in *paradoxus* the larger sized 8-shaped pores are confined to the sides of the protruding caudal portion of the abdomen and to clusters on each side of the four spiracular pore bands, with an occasional large

pore sometimes present in the mid-dorsal area; in *puntuliferus*, in addition to the clusters found in *paradoxus*, there are present large pores in two rows of circularly arranged groups in the mid-dorsal region and in transverse clusters before and behind the spiracular groups. In addition, there are fewer pores in each of the spiracular bands of quinquelocular disk pores.

CEROCOCCUS STELLATUS (Maskell)

Plate 11, figs. 4–9; Plate 12, figs. 1–9; Plate 28, fig. 4

References.—Fernald, Cat. Cocc. World, 1903, p. 58.—Froggatt, Agr. Gaz. N. S. Wales, vol. 26, 1915, p. 1056.

There is in the Maskell collection a single slide of an adult female in fair condition bearing No. 525. This number belongs to the species *bryoides stellata* according to Maskell's lot book, and supplementary mounted specimens from unmounted material with the same lot number likewise agree with this mount. In addition, examples received from Mr. W. W. Froggatt, collected at Mittagong, New South Wales, have been compared with the Maskell specimens, but are considered to represent a distinct species.

Adult female.—Test as described by Maskell; body as mounted nearly circular in outline, excluding the protruding caudal apex of the abdomen, total length around 2.2 mm., width around 1.8 mm.; derm membranous; antennae reduced to stout truncate unsegmented cones, each slightly invaginated and bearing several stout setae at apex; legs represented by flat conical plates, each with a distinctly developed, slightly curved claw protruding from its center; beak short conical, incompletely 2-segmented; marginal setae, as such, apparently not definitely differentiated; no spiracular spines; dorsal and ventral setae few, small and inconspicuous; 8-shaped pores more or less definitely segregated into two size groups with the long dimension of the larger as much as 22μ, and of the smaller as much as 12μ, but both showing much variability, more even than in *bryoides*, these pores intermingled and distributed over the dorsal surface and margins of the body much as in *bryoides*, but with the whorls decidedly less definitely developed; tubular ducts fairly numerous and widely distributed, but small and inconspicuous, length to cup about 21μ; with bands of normally quinquelocular disk pores running from spiracles to margin, these with the bands from each posterior spiracle split and with the halves strongly diverging, often with two (anterior) or one (each posterior half) tiny slender setae at the outer end of the pore band, the numbers of pores in each anterior band around 115, in each posterior compound band around 120; ventral surface with a considerable number of small, scattered multilocular disk pores, often with obscurely bilocular center and usually

with around nine indistinct loculi; cribriform plates in two groups only, each group normally comprised of two small, roughly circular cicatrices, each bordered by a narrow, somewhat protruding chitinized rim; tiny simple pores not observed; anal lobes stout conical, definitely protruding, typically without 8-shaped pores on the lobes, with a long apical seta, about 195μ long, two stout setae on inner face each about 25μ long, and apparently three slender setae below and on outer margin; anal ring small, elliptical, narrow, with an incompletely double row of pores and six setae, each about 70μ long; cauda fairly long, tapering, apex rounded, length about 45μ, width at base about 60μ; inner and ventral faces of lobes more or less chitinized, the inner face faintly areolate; with a pair of long stout and a pair of small slender setae beneath anal ring.

Intermediate female.—Not available.

Larva.—Very closely resembling the larva of *bryoides*, already described, except that the cauda is much longer and protrudes more strongly; various details are exhibited in the drawings.

Cotype.—Cat. No. 40368, U.S.N.M.

This insect is quite readily and quite definitely separated from *bryoides*, with which it was placed as a variety by Maskell, through the possession of much reduced legs, as described. From the other Australian species available for comparison, including *paradoxus* (Maskell) and *punctuliferus* Green, it may be distinguished by the split band of pores running from each posterior spiracle to two widely separated points on the body margin. The other species have only a single undivided band of quinquelocular pores between each posterior spiracle and margin. It can not be compared morphologically with Mr. Froggatt's *pyriformis*, as no specimens of this species are available for study.

Genus FRENCHIA Maskell

Reference.—Morrison and Morrison, Proc. U. S. Nat. Mus., vol. 60, Art. 12, 1922, p. 17.

The type of this genus has already been redescribed in the paper cited above. The only other species now assigned to the genus is considered below.

FRENCHIA SEMIOCCULTA Maskell

Plate 13, figs. 1–12; Plate 14, figs. 1–10; Plate 28, fig. 5

References.—Fernald, Cat. Cocc. World, 1903, p. 39.—Froggatt, Dept. Agr. N. S. Wales, Sci. Bull. No. 18, 1921, p. 159.

The Maskell collection includes five slides of this species, one of "larvae, 1894," one of "early adult female, 1894," one of "test of male pupa, 1894," one of "adult female at gestation, 1894," and one

of "male, 1894." These slides are not satisfactory. The unmounted material is placed under the lot No. 358. The Maskell and Froggatt descriptions should be consulted for descriptive information regarding the galls and other deformations produced by this insect. No supplementary slides of the female stages were obtained from the Maskell type material, but one female was secured from cotype material received through Professor Cockerell.

Adult female.—External appearance and size as described by Maskell; derm membranous throughout; antennae reduced to flat plates bearing some small setae; legs apparently wholly lacking; spiracles rather stout, with several quinquelocular disk pores near the opening of each; beak very short conical, 1-segmented; body with a few scattered setae, these in fairly definite segmental arrangement on the "tail," but in no case large or conspicuous; no spiracular spines; no evident marginal setae; 8-shaped pores, as in the genotype, very much reduced in size and inconspicuous, apparently not at all numerous; tubular ducts present, normal number and situation not certain; body with normally quinquelocular disk pores near the spiracles, with at least a few pores with a large number of loculi, but the actual types, number, and arrangement of the derm pores uncertain from the material available; no cribriform plates; minute simple pores not definitely located; "tail" well developed, though much shorter than in the genotype, sides nearly parallel, with rounded apex; anal ring situated close to apex of "tail," a simple, roughly circular, rather heavily chitinized ring, with a short internal continuation and a smaller ring; genital opening placed only a little anterior to the anal ring.

Intermediate female.—As mounted, stout oval with the ends somewhat narrowed; length 0.62 mm., width 0.52 mm.; derm membranous throughout; antennae reduced to flat plates bearing two small setae; legs wholly lacking; spiracles rather slender, each accompanied by from two to six normally quinquelocular disk pores; no other pore types observed; derm bearing a few small setae and a somewhat larger pair of apical setae; anal ring placed close to the posterior apex of body, simple, incomplete.

Larva (from Maskell slide specimens only).—Body as mounted elliptical or somewhat narrowed behind; derm membranous; antennae 6-segmented but rather short, the second segment somewhat the longest, the apical two with stouter setae; legs not unusual, the tibia apparently quite short; body with some minute setae and with an apical pair around one-fifth the body length; no spiracular spines; 8-shaped pores not particularly conspicuous, although quite evident, with only a submedian and marginal row on each half of body, the incomplete intermediate row often present lacking in this species;

disk pores adjacent to spiracles apparently normally trilocular; no other pore or duct types observed; anal region, so far as can be determined, quite undeveloped, no definite ring, no lobes, no stout setae, and so on, probably as in *casuarinae*.

Cotype.—Cat. No. 40369, U.S.N.M.

The material on which this redescription has been based is so very scant that the description must be regarded as tentative only. There are even some apparent discrepancies between the "tail" and the spiracles as sketched from the Maskell slide and from a cotype specimen received through Cockerell, and drawings from both are therefore presented. Aside from the difference in habit, as described by Maskell, this species and the genotype are distinguished very readily by the shape of the "tail," as was noted when *casuarinae* was recharacterized (reference cited under genus).

Genus LECANIODIASPIS Targioni-Tozetti

With five species out of a total of about 33 described, Maskell's contribution to this genus is of some importance, particularly as the species were derived from widely separated localities—Australia, Southwestern United States, and South Africa. The described members of the genus are at present so poorly organized that little more than suggestions can be offered as to the actual relation of Maskell's species to the other species of *Lecaniodiaspis*.

LECANIODIASPIS ACACIAE (Maskell)

Plate 15, figs. 1–13; Plate 16, figs. 1–28; Plate 28, fig. 6

References.—Fernald, Cat. Cocc. World, 1903, p. 54.—Froggatt, Agr. Gaz. N. S. Wales, vol. 26, 1915, p. 760.

The Maskell collection contains four slides of this species, one of "adult female, 1892," two of "2nd stage females, 1892," and one of "larva, 1892." Unfortunately, all of these mounts are poor and the specimens considered to be second stage females are in reality late larvae. Besides, there is a quantity of unmounted material under No. 233 from which supplementary mounts have been obtained, and additional mounted specimens from material received from Australia through other sources have also been examined.

Adult female.—See Maskell and Froggatt references for descriptions of test and of external appearance of insect; body of female, as mounted, more or less distinctly broader than long, probably due to permanent distortion at oviposition, length about 2.5 mm., width about 2.6 mm.; derm entirely membranous except for appendages and anal structure; antennae present, about half developed, more or less distinctly 3 to 5 segmented, length about 80μ, width about

30μ, with a cluster of spines, including two or three stouter, at the apex; legs present as conical tubercles, each bearing a well-developed claw with denticle and digitules; spiracles small, placed rather near margin, the anterior and both halves of the split posterior bands of disk pores running to margin more than two wide; mouth parts not unusual, the beak apparently 1-segmented; marginal setae present, stout conical, spinelike, each set in a heavy basal collar, and each bluntly rounded at apex; spiracular spines present, in pairs, the anterior two on each side close together, the posterior two well separated, each more or less curved and sometimes with expanded apex, but usually nearly cylindrical, tapering slightly to a rounded apex, average length about 29μ, with an occasional small slender dorsal seta set in flat base, with a few minute ventral setae near antennae and perhaps elsewhere, and with two conspicuously large (about 46μ), widely separated setae anterior to anal structure and, between these, a pair of smaller setae; also with a ventral marginal row of small slender setae; 8-shaped pores abundant, but all small, distributed uniformly over the dorsal surface in a single marginal row, an irregularly alternating double to triple row immediately below the marginal row, in small ventral clusters adjacent to spiracular spines, and, as more minute, somewhat modified pores, scattered widely over the ventral surface; tubular ducts present, distributed over the whole dorsal surface, somewhat more numerous near margin; quinquelocular disk pores confined to region between spiracles and spiracular spines, rarely with more than five loculi; multilocular disk pores, with 10–12 loculi, abundant ventrally in crowded transverse segmental bands posteriorly, but in more scattered single segmental rows anteriorly as far as the posterior spiracles, the rows extending practically from margin to margin; with a row of scattered tiny simple disks along the margin about midway between the single and double rows of 8-shaped pores and with others somewhat smaller, scattered over the dorsum and about as numerous as the 8-shaped pores; cribriform plates present, in the two rows characteristic of the genus, but relatively very small and inconspicuous, numbers in each row varying from four to seven; general composition of anal region as in other members of the genus; apical seta stout, about 26μ long; dorsal transverse plate somewhat angulate, or notched behind, lateral plates each with a number of conspicuous, heavily chitinized, longitudial folds or wrinkles, and near the inner posterior face, with three stout setae, each about 11μ in length, and with four slender setae below at the junction of these plates; anal ring slender, with pores and 10 setae.

Second stage female.—Specimens believed to represent this stage of *L. acaciae* Maskell, but from other than the type material, have

been studied and illustrated. The figures should be adequate for the recognition of this stage, and no description is attempted.

Larva (embryonic).—As mounted, nearly uniformly elliptical or slightly narrowed behind, length about 393μ, width about 232μ; antennae normally 6-segmented, the apical longest, the third next, total length about 153μ; legs not unusual, claw long, with distinct denticle near apex, both pairs of digitules well developed, attaining about the same distance beyond the tip of the claw, all slightly knobbed at apices, those of tarsus actually longer and about twice as stout as those of claw; spiracles not unusual, with a single quinquelocular pore adjacent to each, anterior with three such pores leading to spiracular spines, posterior without additional pores; marginal setae slender spinelike, blunt at apices; spiracular spines stout, the anterior two adjacent, the posterior two well separated and about half the length of the anterior, dimensions about as follows, but variable, anterior 7μ, posterior 4μ; with an occasional tiny dorsal seta in the posterior abdominal region; ventrally, at least in the abdominal region, with a submarginal row of tiny setae and a submedian row of much larger setae on each side; with the posterior submedian seta conspicuously larger, about 152μ; 8-shaped pores present, relatively small, in longitudinal rows, at least in the abdominal region, one submarginal row ventrally.

Cotype.—Cat. No. 40370, U.S.N.M.

This species and the other Australian species available for comparison, including *convexus* Froggatt, *eucalypti* Maskell, *frenchii* Froggatt, and *melaleucae* Fuller, appear to form a legitimate group within the genus, characterized chiefly by the relatively minute size of the individual cribriform plates. It is not at present certain that any other species may properly be associated with these. This species differs from the related *eucalypti* of Maskell most obviously through lack of the mid-dorsal bands of larger 8-shaped pores present and forming a distinct cross dorsally in *eucalypti*, and through possession of a larger number of the much reduced cribriform plates, normally seven to each longitudinal row, in comparison with a normal of four to each row in *eucalypti*. In addition, the marginal setae are distinctly stouter and bluntly rounded at tips in *acaciae*.

LECANIODIASPIS ATHEROSPERMAE (Maskell)

Plate 17, figs. 1–8; Plate 18, figs. 1–13; Plate 29, fig. 1

References.—Fernald, Cat. Cocc. World, 1903, p. 54.—Froggatt Agr. Gaz. N. S. Wales, vol. 26, 1925, p. 761.

The Maskell collection contains two slides of "adult female, 1895," one of which is well prepared, but unstained. Several additional

specimens are included in the unmounted material of the species to which has been assigned the lot No. 500. The redescription which follows is based chiefly on supplementary mounts prepared from this unmounted material.

Adult female.—See Maskell and Froggatt references for descriptions of test and of external appearance of insect; body, as mounted, elliptical, longer than wide in early adult to stout, nearly circular or broader than long in mounted examples of old shriveled specimens, length and width of early adult 1.5 and 1.2 mm.; of old adult 1.6 and 1.8 mm.; derm membranous throughout; antennae fairly well developed, normally 8 to 9 segmented, about 196μ long, the three apical segments bearing stout sensory setae; legs wanting; spiracles not unusual in shape, size, or position, marginal setae fairly stout, with large bases, total length about 10μ, width of base 7μ, not numerous, not conspicuous, with two anterior spiracular spines, these conspicuously differentiated in size, one about 70μ, the other about 35μ, but with only a single posterior spine, this approximating the larger anterior in size, about 70μ, and with only a single band of disk pores leading from posterior spiracle to body margin, instead of the two diverging bands usually present; dorsal surface of body with a very few relatively large, short, stout setae, about 9μ long, and so approaching the marginal in size and appearance; ventral surface with a submarginal row of moderately stout setae immediately adjacent to the marginal row and about as long as the dorsal, with a pair of much larger setae anterior to the anal region, each about 90μ long, and with a few slender, delicate setae scattered elsewhere, more abundant in the genital region; 8-shaped pores of derm small, numerous and rather uniformly distributed dorsally, with a loose triple row along the body margin somewhat larger, largest at margin immediately adjacent to the ends of the spiracular pore bands, ventral submarginal area with still smaller 8-shaped pores, these apparently lacking over the mid-ventral area; tubular ducts large and numerous dorsally, although not so abundant as the 8-shaped pores; with several (up to seven) transverse segmental rows of multilocular disk pores, each pore normally with 10–11 loculi, ventrally on the abdomen; spiracular disk pores in a single band from each spiracle to margin, each normally with five loculi; with a few minute simple disk pores ventrally near margin; cribriform plates small but evident, not minute and inconspicuous as in *acaciae*, normally in two rows of four each; anal area as in other species but with the upper half of each plate distinctly imbricate-reticulate, the upper edge of each bearing two moderately stout setae about 20μ long; anal ring narrow, bearing eight setae; apical seta relatively conspicuous, rather slender, but 110μ long.

Preadult female.—In general resembling the adult female; smaller, body longer than wide; antennae normally 7-segmented; legs wanting; dorsum and margin with small 8-shaped pores; spiracular spines and spiracular disk pore bands as in adult; cribriform plates wanting; marginal setae rather inconspicuous; anal area not so well developed, but the plates showing imbricate-reticulate areas.

Larva (embryonic only).—Ovate, somewhat broader anteriorly, length 320μ, width 210μ; antennae 6-segmented, apical somewhat the longest; legs not unusual; all body setae minute, marginal not evidently differentiated in appearance from the others; spiracular spines as in adult, two anterior on each side, one long, one short, one posterior, this also short, not elongate as in later stages; 8-shaped pores in submedian, intermediate and marginal rows on each half of body dorsally; tubular ducts not located; anal ring narrow with eight setae; anal plates areolate; apical setae perhaps one-third length of embryonic body.

Cotype.—Cat. No. 40371, U.S.N.M.

This insect is plainly associated with several other species in *Lecaniodiaspis* through having the upper, outer margins of the anal plates distinctly imbricate-reticulate or longitudinally long areolate for a varying depth. These associated species definitely include *baculifera* Leonardi from Java, *malaboda* Green from Ceylon, and *quercus* Cockerell from Japan. Perhaps some other species, known to the writers only through incomplete published descriptions, may also possess this conspicuous differentiating characteristic.

LECANIODIASPIS EUCALYPTI (Maskell)

Plate 19, figs. 1–17; Plate 20, figs. 1–11; Plate 21, figs. 1–13; Plate 29, fig. 2

References.—Fernald, Cat. Cocc. World, 1903, p. 55.—Froggatt, Agr. Gaz. N. S. Wales, vol. 26, 1915, p. 762.

There are four slide mounts of this species in the Maskell collection, as follows: One of "adult female, 1892," one of "antennae, 1892," one of "2nd stage female, 1892," and one of "larvae, 1892," A small quantity of unmounted material is included under No. 246. Supplementary mounts have been prepared from this, and additional specimens, collected on Eucalyptus in Australia by Mr. George Compere, have likewise been available.

Adult female.—See Maskell and Froggatt references for description of test and of body of female; early adult elliptical, distinctly longer than broad, length about 1.8 mm., width about 1.3 mm.; older examples somewhat broader; derm membranous throughout or becoming faintly chitinized posteriorly; antennae fairly well developed, about 215μ long, normally 6 to 8 segmented, the last three bearing elongate, but thick, slightly curved sensory setae; legs

present but poorly and faintly developed, elongate cones with the joints indistinctly, and claw poorly developed; beak short conical, 1-segmented; marginal setae rather short and stiff, each perhaps 17μ long, but not stout, few in number, and accompanied by a few somewhat smaller ventral submarginal setae; the two anterior spiracular spines placed together, at most only somewhat unequal in length, the longer about 43μ, posterior two on each side widely separated, approximately equal in size, about 38μ long; dorsal and ventral surfaces with a few tiny, slender setae, these longer below and most numerous around genital opening, the pair of much elongated slender setae usually found ventrally just anterior to the anal complex wanting or much reduced in size; with small 8-shaped pores scattered rather thickly and uniformly over the dorsal surface, with definitely but not conspicuously larger 8-shaped pores in one longitudinal and one transverse band dorsally forming a distinct cross, in a submarginal row joined at intervals to the margin and in a band along the margin, most of these larger pores somewhat invaginated; this arrangement most obvious in early adult females, rather obscured in the fully matured examples; tubular ducts elongate, slender, numerous, more abundant towards margin; multilocular disk pores present in eight transverse rows on the ventral abdominal segments, the anterior ones only a single pore wide, the posterior ones fairly broad bands, these mostly with 10 loculi; spiracular disk pores normally quinquelocular, those at margin distinctly larger than those near spiracle, the anterior band fairly wide, the posterior split, the halves running diagonally to each spiracular spine; tiny simple pores widely but sparsely distributed over the dorsum and at margin, apparently wanting ventrally; cribriform plates small and inconspicuous, resembling those of *acaciae*, normally in two rows of four each; anal area not peculiar, the plates heavily wrinkled and ridged but not areolate, with two stout setae near to but not on the upper margin of each, these about 14μ long, anal ring narrow, with 10 somewhat swollen setae with delicately produced tips, apical seta not differentiated from marginal, not very stout, short, about 14μ long.

Preadult female.—In general much as in adult, but less developed; amply figured in the illustrations accompanying the paper, so not described.

Larva.—Elliptical, length as mounted 430μ, width 215μ; antennae 6-segmented, the apical longest, the three apical bearing stouter sensory setae, total length about 165μ; posterior spiracular spines relatively inconspicuous, other structures as shown in figures; length of largest spiracular spine about 8μ; anal plates faintly wrinkled but not areolate.

Cotype.—Cat. No. 40499, U.S.N.M.

The obvious differences between this insect and its nearest relative among the Maskell species, *L. acaciae*, have been pointed out under the discussion of that species.

LECANIODIASPIS MIMOSAE (Maskell)

Plate 22, figs. 1–17; Plate 23, figs. 1–13; Plate 29, figs. 3, 4

Reference.—Fernald, Cat. Cocc. World, 1903, p. 55.—Brain, Bull. Ent. Res., vol. 10, 1920, p. 116.

The Maskell collection contains three slides of this species, one of "adult female, 1896," one of "male pupa, 1896," and one of "larva, 1896," none of which are at all good. There is a small quantity of unmounted material under No. 533. Supplementary slides have been prepared from this, and the following redescription is based chiefly on these, with reference to additional South African specimens from other sources.

Adult female.—See Maskell and Brain references for description of test and of external appearance of the female; body, as mounted, short elliptical, length about 3.2 mm., width about 2.7 mm.; derm membranous throughout; antennae fairly well developed, normally 9-segmented, the terminal three with stouter, curved, sensory setae; legs present as tiny stubs or perhaps entirely wanting sometimes; spiracles set well in from margin, the disk pore bands correspondingly elongate; beak short conical, 1-segmented; marginal setae rather slender, about 18μ long, few in number; anterior spiracular spines present, relatively elongate, and slender, approximately equal in length, about 62μ long, the ends often clavate, but variable; pore band from posterior spiracle split and diverging, but the spines apparently normally lacking, from the few specimens examined; with a few small, slender scattered dorsal setae perhaps 10μ long, with similar small scattered ventral setae, more numerous and larger in the genital region, the long pairs before the anal complex poorly developed, only about 36μ long; with numerous small 8-shaped pores distributed nearly uniformly over the dorsal surface, becoming larger and more crowded at the margin, but not forming a distinctly set-off marginal band, also continued onto the ventral surface, but again as small pores, as far towards the middle line as the spiracles; tubular ducts numerous dorsally, slender and quite elongate, somewhat more abundant towards margin; multilocular disk pores in seven rows or bands across the ventral surface of the abdomen, the posterior bands containing numerous pores, the anterior very attenuated, obscure, including relatively few, scattered pores, these all normally with 10 loculi; spiracular disk pores normally quinquelocular, forming a single band from anterior spiracle to margin, but a branched or diverging double band from the pos-

terior to margin; cribriform plates approximately circular, relatively large and conspicuous, densely pitted, normally in two longitudinal rows of five each; tiny simple pores distributed sparsely but fairly uniformly over the dorsal surface and to some extent along the margin ventrally; anal region not unusual, the plates rather heavily ridged and wrinkled, with two moderately stout setae near the outer end of each plate and at about its middle dorso-ventrally, these about 18μ long, each anal plate with from one to three or four small circular pores; apical seta moderately elongate, stout, length about 60μ; anal ring with 10 setae, length of one about 125μ.

Preadult female.—In general resembling the adult; legs more evident, antennae with fewer segments, spiracular grooves with fewer disk pores, the anterior with two elongate spines at margin, the posterior split into two diverging rows but without spiracular spines, as in adult; anal ring with eight setae.

Larva.—Elliptical or somewhat tapering behind, length about 430μ, width about 230μ; antennae as in other species, legs not unusual; marginal setae short, not stout, with a pair of small anterior spiracular spines on each side, the posterior ones wanting as in adult; with a few minute setae dorsally and ventrally; 8-shaped pores in a submedian, intermediate and marginal row on each half of the body, and in a ventral submarginal row, these last much smaller than the dorsal pores; with a few (two to four) normally quinquelocular disk pores between spiracles and body margin; ventral surface of abdomen with one pair of much more elongate slender setae anterior to the anal plates; anal plates wrinkled, each bearing a single moderately stout seta near apex; anal ring with six setae; apical seta quite elongate.

Cotype.—Cat. No. 40372, U.S.N.M.

The apparently normal absence of the posterior spiracular spines in this species seems to be a noteworthy, and perhaps a distinctive structural feature.

LECANIODIASPIS PROSOPIDIS (Maskell)

Plate 24, figs. 1–20; Plate 29, fig. 5

Reference.—Fernald, Cat. Cocc. World, 1903, p. 55.

There are five slides of this species in the Maskell collection, three of "adult female, 1894," one of "antennae of female, 1894," and one of "abdomen of female, 1894." These are in fair condition only. Some unmounted specimens are included under No. 417. The following redescription is based on mounts prepared from this, supplemented by specimens collected by Dr. E. A. Schwarz in 1897 at Tuscon, Ariz., on *Prosopis.*

Adult female.—See Maskell paper for description of test; body as mounted as much as 2.6 mm. long by 2.2 mm. wide, usually ovoid, somewhat broadened behind the middle; derm membranous throughout; antennae fairly well developed for the genus, normally 8-segmented; length about 230μ, some, at least, and probably all of the legs present as short poorly developed stubs; spiracles stout but not large, set well in from the margin, the anterior joined to margin by pore band about three pores wide, the posterior with a split and diverging double band reaching the margin at two points and each portion about one to two pores wide; beak stout conical, 1-segmented; marginal setae apparently very few, actually definitely observed only near posterior apex of body, here slender, rather elongate, about 17μ long; with the two anterior spiracular spines on each side closely associated, approximately equal in length, measuring from 29μ to 40μ in length, variable in shape, sometimes somewhat clavate, usually more nearly cylindrical, usually slightly curved, posterior two on each side well separated from each other, resembling the anterior in size and shape, but usually a little shorter, around 28μ to 36μ long; with an occasional small dorsal seta, these, however, apparently quite rare, and ventrally with an occasional small stiff seta, and, in the region of the genital opening, several elongate, slender setae with one pair anterior to the anal plates still longer but very slender and not at all conspicuous, perhaps 48μ long; 8-shaped pores, although small, fairly numerous and rather uniformly distributed dorsally, definitely, though not conspicuously larger towards and at margin, these last bounded in the submarginal ventral area by a fairly distinct loose double row of smaller 8-shaped pores each definitely aligned along the axis of the row; and with much smaller obscurely 8-shaped pores scattered between this band and spiracles; tubular ducts rather numerous, approximately uniformly distributed dorsally, somewhat more abundant towards margin, of moderate size; abdominal disk pores, normally with 10 loculi each, in eight definite transverse rows with traces of a ninth visible, the three posterior actually clusters or bands of pores, the remainder single rows, these much attenuated anteriorly; spiracular disk pores normally quinquelocular, the anterior band entire, the posterior split, the two parts diverging to the margin; tiny simple pores scattered fairly uniformly over dorsum, not numerous; cribriform plates normally in two rows of three each, roughly circular, longest diameter around 25μ–28μ, surface somewhat convex medially, finely and closely areolate; anal plates, as flattened on slide, triangular, ridged and wrinkled, bearing two relatively large setae near middle line, well away from upper margin, each of these about 21μ long, and one to three tiny pores, without setae, on the posterior margin of the bar joining them below; anal ring narrow, with pores and 10 setae each

around 110μ long; apical setae fairly large and stout, about 82μ long.

Preadult female.—No examples of this or other intermediate stages available.

Larva.—Ovoid, slightly broader before the middle, length about 520μ, width about 270μ; antennae 6-segmented, about 180μ long, terminal longest, last three with stouter curved sensory setae; legs not unusual; beak short conical, 1-segmented; marginal setae slender, about 7μ long, spiracular spines apparently variable, the anterior usually in twos, 3–6μ long, posterior apparently single, perhaps sometimes wanting or very short, perhaps 3μ, or resembling the marginal; with a few minute setae dorsally and ventrally; 8-shaped pores in submedian, intermediate, and marginal rows on the anterior portion of body, the intermediate row lacking on the abdomen; anal plates poorly developed, each bearing a single moderately stout seta; anal ring narrow, with pores and six setae; apical seta elongate, about 225μ.

Cotype.—Cat. No. 40373, U.S.N.M.

This species is a member of a very complex and very difficult group within the genus, probably now comprising a total of 10 described North and South American species. The actual status of all these supposedly valid species is uncertain at this writing; however, *prosopidis* may apparently be separated from all of those described from North America by at least one definite morphological character. All of the adult females of *prosopidis* that have been examined have only three cribriform plates in each of the two rows. All of the other North American species appear to possess four or five of these structures in each row.

Genus SOLENOCOCCUS Cockerell

Reference.—Morrison and Morrison, Proc. U. S. Nat. Mus., vol. 60, art. 12, 1922, p. 21.

Studies on related genera and species, particularly on the genus *Cerococcus*, have not progressed sufficiently to establish definitely the status of this genus and it is therefore left without change in this paper, although there seems to be much evidence to indicate that at least the two New Zealand species included here can hardly be separated generically on a morphological basis from the Australian and Fijian species that are currently assigned to the genus *Cerococcus*. The genus *Solenococcus* as now accepted is actually based on the development of a posterior apical protruding tube on the test of the adult female. Such a character can hardly be considered as having generic significance, particularly as an exactly parallel condition has been accepted in the genus *Asterolecanium* without a suggestion that the

species whose test possesses such a tube should be segregated into another genus. The genotype species *S. fagi* (Maskell) has already been redescribed (reference cited above), and a redescription, with figures, is given below for Maskell's other included species.

SOLENOCOCCUS COROKIAE (Maskell)

Plate 25, figs. 1–11; Plate 26, figs. 1–10; Plate 29, fig. 6

Reference.—Fernald, Cat. Cocc. World, 1903, p. 58.

The Maskell collection includes three slides of this species, one of "adult female, on *Corokia cotoneaster*, Sept., 1889," one of "female, 2nd stage, Apr., 1890," and one of "male, Feb. 7, 1890." There is also a small quantity of unmounted material under No. 110.

Adult female.—See Maskell description for information regarding the character of the test inclosing the insect; body, as mounted, stout oval to nearly globular, somewhat narrowed posteriorly and with apex of abdomen protruding slightly, length about 1.3 mm., width 1.1 mm.; derm membranous, excepting only the inner margins of the anal lobes; antennae short, stout, obscurely 2-segmented, tubercles bearing five or six setae at tip but not invaginated at apex; legs wanting; spiracles with slender bar and with a cluster of quinquelocular pores at one side of opening, these continued as an irregular row to the margin, those opposite the anterior spiracle terminating in a close cluster, the row totaling about 80, those opposite posterior spiracle forming two diverging rows terminating in two distinct, well-separated clusters at the margin; beak short, stout conical, incompletely 2-segmented; margin between dorsal and ventral surfaces not definitely indicated, but with widely separated slender setae in the lateral region possibly indicating the margin; spiracular spines wanting; with an occasional minute seta dorsally, and with these longer and larger over the ventral surface; 8-shaped pores abundant dorsally, varying considerably in size as indicated in figure, the larger pores more or less distinctly aggregated near the median line and along the margin, and 8-shaped pores also present ventrally on the posterior portion of the body in transverse rows accompanying the multilocular disk pores, remaining anterior portion of ventral surface with numerous and uniformly scattered, smaller, modified 8-shaped pores; tubular ducts numerous dorsally but not conspicuous, also occurring to some extent ventrally; quinquelocular pores in bands from spiracles to margin as already described, and, in addition, in a marginal band from the posterior spiracular band to the antenna on each side, multilocular disk pores in five long transverse rows in the ventral abdominal region, size varying somewhat, loculi varying from 6 to 10; with minute, simple chitinized circles, possibly pores, sparsely present over both surfaces; cribriform plates present, in two clusters of

six to eight each but the individual plates tending to coalesce, till so few as two grouped plates to a cluster may be present; anal region developed into two rather long conical lobes, each membranous except for inner face, this broadly chitinized at base and concave, the two thickenings forming a more or less distinct collar around anal setae, with a rather stout apical seta about 78μ long at end of each lobe and with two rather stout subapical and a submedian seta on inner face, each of these as much as 21μ long, and the ventral subapical much more slender than the others; each lobe with three 8-shaped pores; with a large and conspicuous median cauda, about 50μ long by 60μ wide at base, this tapering and rather distinctly angulate at apex; with two rather large and stout and, anterior to these, two much smaller setae below the anal ring; ring with pores and eight setae, the last about 80μ long; ventral abdominal derm tending to protrude beyond anal lobes.

Larva.—Ovoid, distinctly tapering posteriorly, length about 230μ; antennae 6-segmented, the third the longest; legs slender, not unusual, claw very slender, with denticle near tip; both pairs of digitules present, exceeding claw, those of claw only slightly knobbed at apices; 8-shaped pores present, large and conspicuous, in three rows, marginal, submedian and intermediate on anterior portion of body but only the first two present posteriorly, caudal structures in general similar to those of adult, the same elements present, but less developed, anal seta about 150μ long; marginal setae small, not conspicuous; no traces of spiracular spines.

Cotype.—Cat. No. 40374, U.S.N.M.

The two New Zealand species of *Solenococcus* may be separated very readily by the condition of the cribriform plates. In *fagi*, four, grouped in two pairs, are present; in *corokiae*, while there are also only two groups, there may be as many as six plates in each of the groups, or if there is fusion, the plates may be quite elongate instead of roughly circular. These two species are differentiated from all of the Australian *Cerococcus* species through the absence of even aborted legs, resembling the Fijian *Cerococcus bryoides* in this respect. From this last, the two New Zealand species differ in individual details, *fagi*, while normally with four cribriform plates grouped in two pairs, lacking any large-sized 8-shaped pores in the mid-dorsal area, and *corokiae*, while possessing a limited number of these large pores in the mid-dorsal region, having a far smaller number than *bryoides* and normally having many more than two plates in each of the two cribriform plate clusters. The test of *bryoides*, with its conspicuous tufts of secretion, is, of course, strikingly different from the nearly smooth test of the two New Zealand species with the protruding apical tube.

EXPLANATION OF PLATES

The photographic illustrations shown on Plates 27, 28, and 29 are from negatives prepared by Mr. J. G. Sanders and Mr. J. G. Pratt as follows: Figures 1, 2, 3, and 4 of Plate 27; Figures 1, 4, and 6 of Plate 28; and Figures 1, 2, 3, 4, 5, and 6 of Plate 29 are from negatives made by Mr. Sanders; Figures 5 and 6 of Plate 27; and Figures 2, 3, and 5 of Plate 28 are from negatives made by Mr. Pratt.

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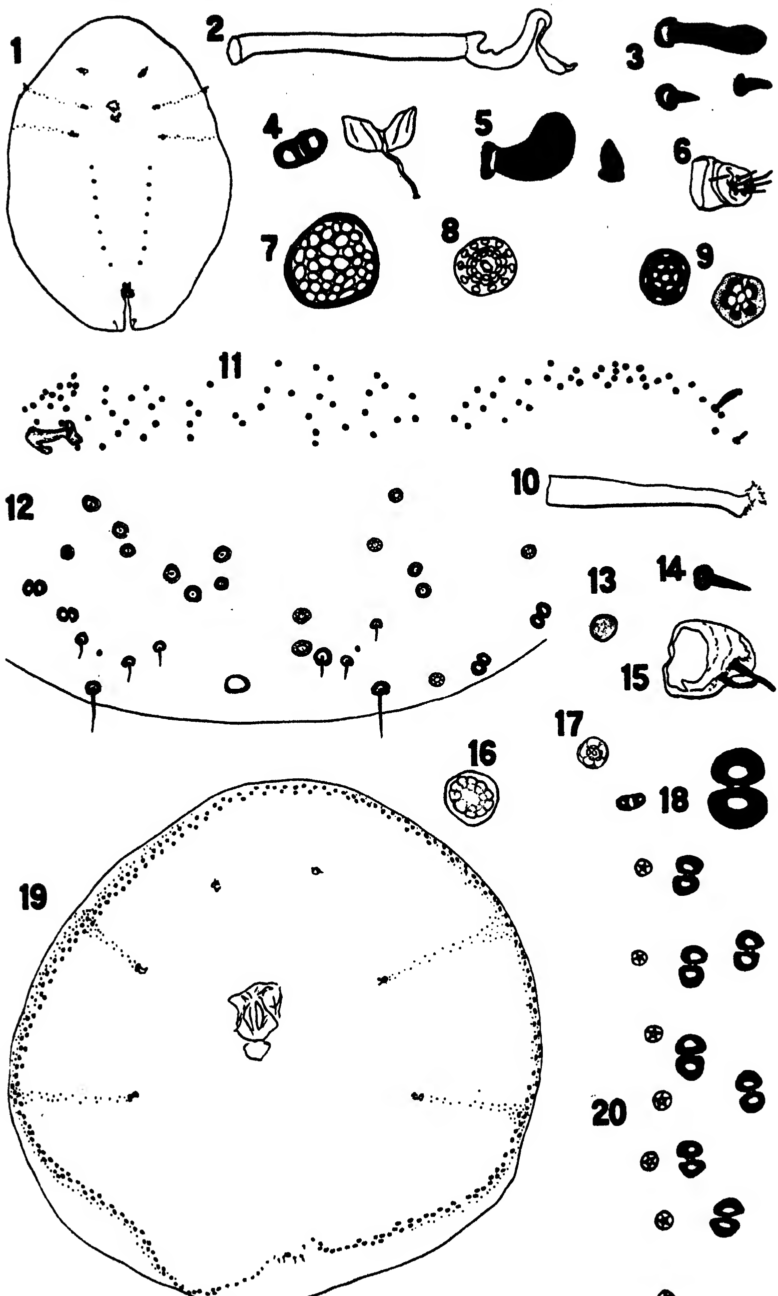


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 37

Plate 1

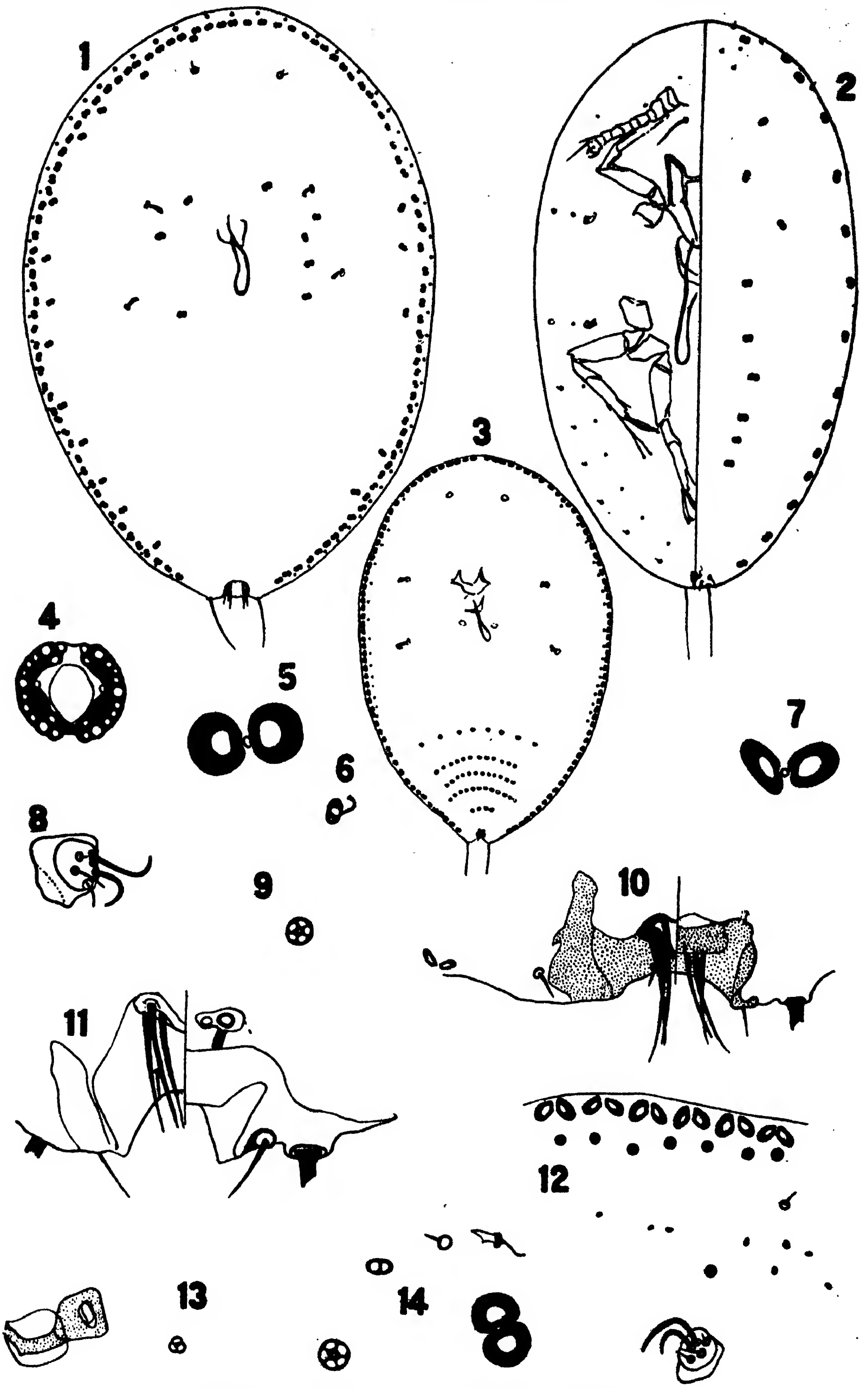
Amorphococcus leptospermi, new species, adult female, except one, and *Asterolecanium acaciae*, new species, adult female.

Figure 1, *leptospermi*, adult female, outline, optical section, ×12; 2, same, tubular duct, ×1,280; 3, same, spiracular spines, including a second smaller one to show variation in shape, ×430; 4, same, dorsal 8-shaped pore, ×1,280; 5, *leptospermi*, larva, anterior spiracular spines, ×1,280; 6, *leptospermi*, adult female, antenna, ×230; 7, same, single cribriform plate, ×1,280; 8, same, posterior ventral abdominal multilocular disk pore, ×1,280; 9, same, quinquelocular disk pores from spiracular band, showing variation in appearance under differing optical conditions, ×1,280; 10, same, anterior spiracle to margin quinquelocular pore band, ×120; 11, *acaciae*, adult female, tubular duct, ×1,280; 12, same, apex of abdomen, optical section, ×115; 13, same, spiracular quinquelocular disk pore, ×1,280; 14, same, subapical seta, ×1,280; 15, same, antenna, ×650; 16, same, posterior ventral abdominal multilocular disk pore, ×1,280; 17, same, marginal quinquelocular disk pore, ×1,280; 18, same, dorsal (left) and marginal (right) 8-shaped pores, ×1,280; 19, same, outline, optical section, showing particularly the condition of the marginal band of pores, ×60; 20, same, section of marginal pore band caudad of posterior spiracle, ×650.

PLATE 2

Asterolecanium epacridis (Maskell), adult female, and
Asterolecanium stypheliae (Maskell), larva and adult female.

Figure 1, *epacridis*, adult female, outline, optical section, ×115; 2, *stypheliae*, larva, outline, dorsal and ventral, ×230; 3, *stypheliae*, adult female, outline, optical section, ×115; 4, same, anal ring, ×820; 5, same, marginal 8-shaped pore, ×1,500; 6, same, tiny dorsal 8-shaped pore, ×1,500; 7, same, another 8-shaped pore from marginal band, ×1,500; 8, same, antenna, ×820; 9, same, quinquelocular disk pore, ×1,500; 10, same, anal region, dorsal and ventral, ×650; 11, same, larva, posterior apex of body, ×1,500; 12, same, adult female, antenna and anterior margin of body, ×650; 13, same, larva, spiracle and adjacent pores, ×1,500; 14, same, larva, types of derm pores and seta, ×1,500.



MASKELL SPECIES OF ASTEROLECANIINAE

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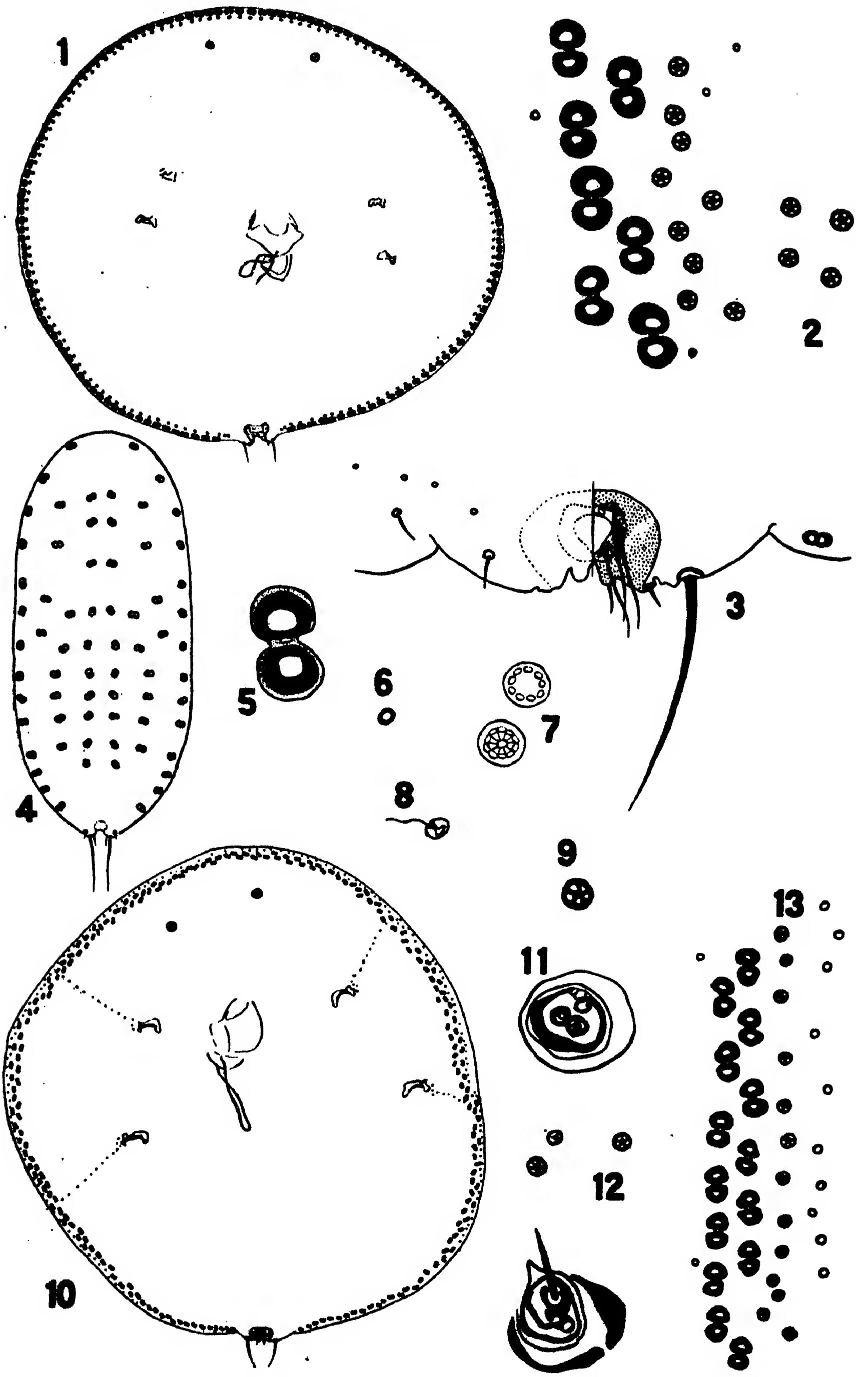


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 39

Plate 3

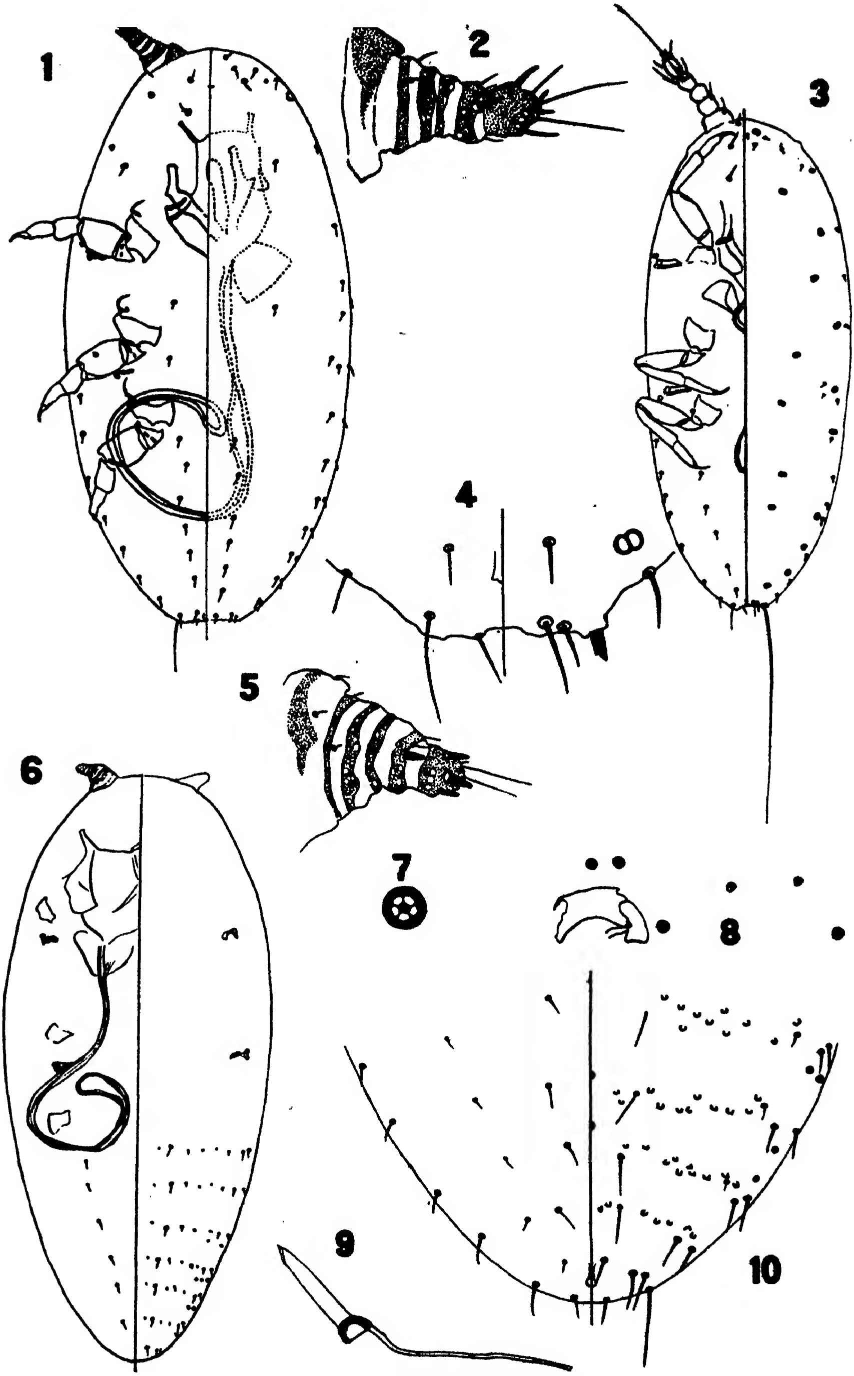
Asterolecanium transversum, new species, adult female and larva, and *Asterolecanium ventruosum* (Maskell), adult female.

Figure 1, *transversum*, adult female, outline, optical section, ×90; 2, *ventruosum*, adult female, marginal pores opposite posterior spiracle, ×820; 3, *ventruosum*, same, apex of abdomen, dorsal and ventral, ×530; 4, *transversum*, larva, outline, dorsal, showing pore arrangement, ×230; 5, *ventruosum*, adult female, marginal 8-shaped pore, ×1,280; 6, same, simple pore, ×1,280; 7, same, posterior ventral abdominal multilocular disk pores, ×1,280; 8, same, minute dorsal 8-shaped pore, ×1,280; 9, same, marginal quinquelocular disk pore, ×1,280; 10, same, outline, optical section, ×90; 11, same, antenna, ×820; 12, same, another antenna with adjacent disk pores, ×820; 13, same, portion of marginal pore band caudad of posterior spiracle, ×430.

PLATE 4

Callococcus acaciae (Maskell), second stage female and larvae.

Figure 1, dimorphic larva, outline, dorsal and ventral, ×165; 2, same, antenna, ×530; 3, normal larva, outline, dorsal and ventral, ×165; 4, same, apex of abdomen, dorsal and ventral, ×530; 5, assumed second stage female, antenna, ×530; 6, same, outline, dorsal and ventral, ×120; 7, same, quinquelocular disk pore adjacent to spiracle, ×1,500; 8, same, spiracle to margin region, ×530; 9, same, tubular duct, ×1,500; 10, same, apex of abdomen, dorsal and ventral, ×230.



MASKELL SPECIES OF ASTEROLECANIINAE

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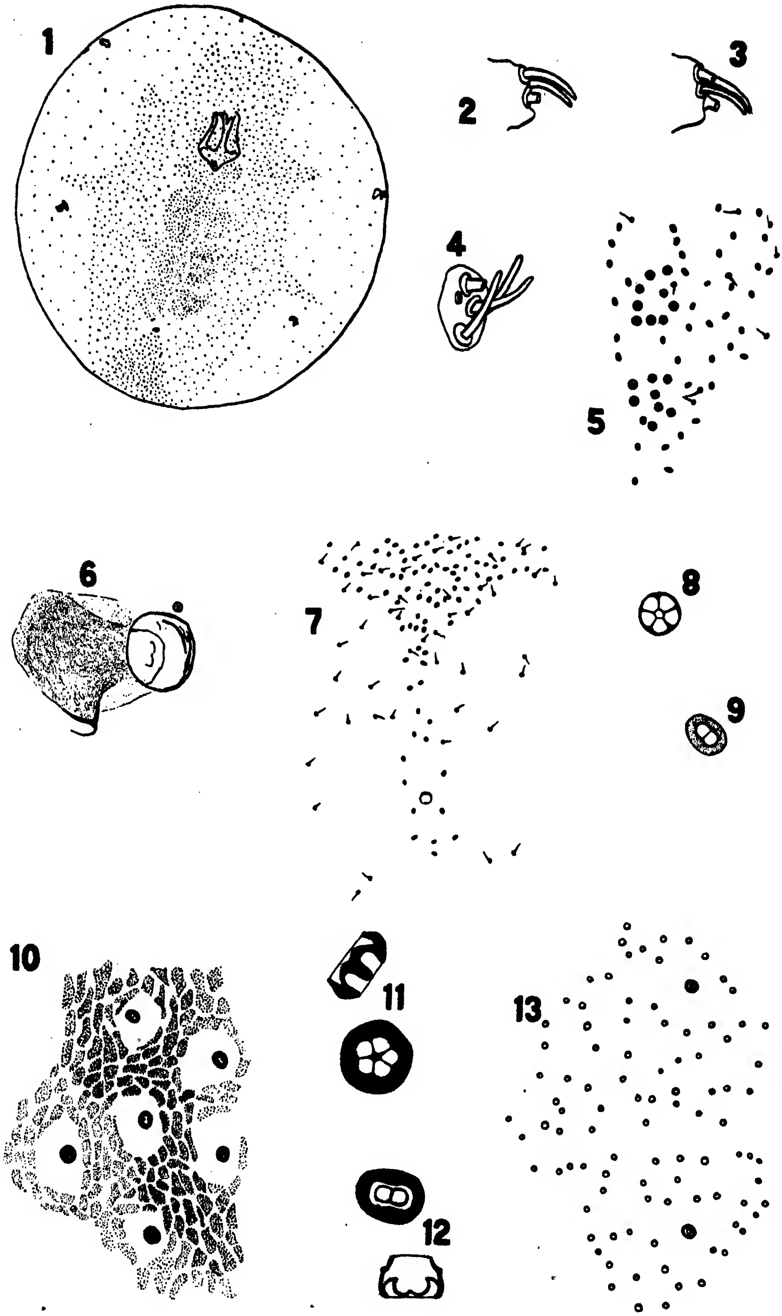


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE, SEE PAGE 41

Plate 5

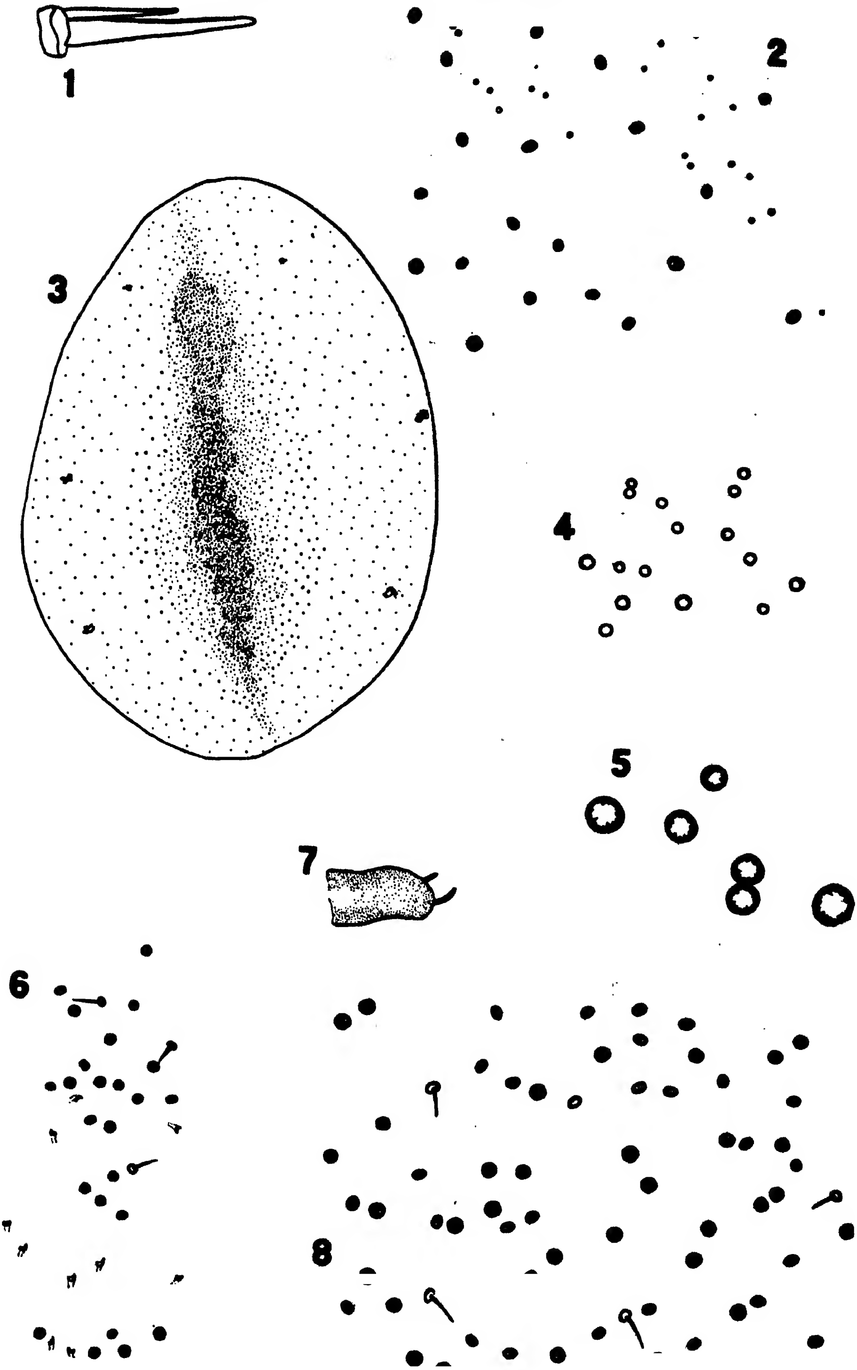
Callococcus acaciae (Maskell), adult female, and
Callococcus leptospermi (Maskell), adult female.

Figure 1, *acaciae*, outline of body, optical section, ×18; 2, 3, and 4, same, antennae, ×820; 5, same, portion of margin of dorsal band, × 230; 6, same, spiracle, ×230; 7, same, posterior apex of dorsal pore band, showing anal ring and adjacent pores and setae, ×120; 8, same, quinquelocular disk pore, ×1,500; 9, same, 8-shaped pore, ×1,500; 10, *leptospermi*, detail of portion of dorsal pore band, ×350; 11, same, larger quinquelocular disk pore, two views, ×1,500; 12, same, 8-shaped pore, two views, ×1,500; 13, same, area from middle section of dorsal pore band, ×350.

PLATE 6

Callococcus leptospermi (Maskell), adult female.

Figure 1, apical seta, from posterior ventral apex of body, ×530; 2, area from anterior median section of dorsal pore band, ×350; 3, outline of body, somewhat schematic, ×7.5; 4, minute simple pores from middle of dorsal pore band, ×530; 5, same, ×1,500; 6, anterior end of dorsal pore band, ×230; 7, antenna, ×350; 8, area from posterior section of dorsal pore band, ×350.



MASKELL SPECIES OF ASTEROLECANIINAE

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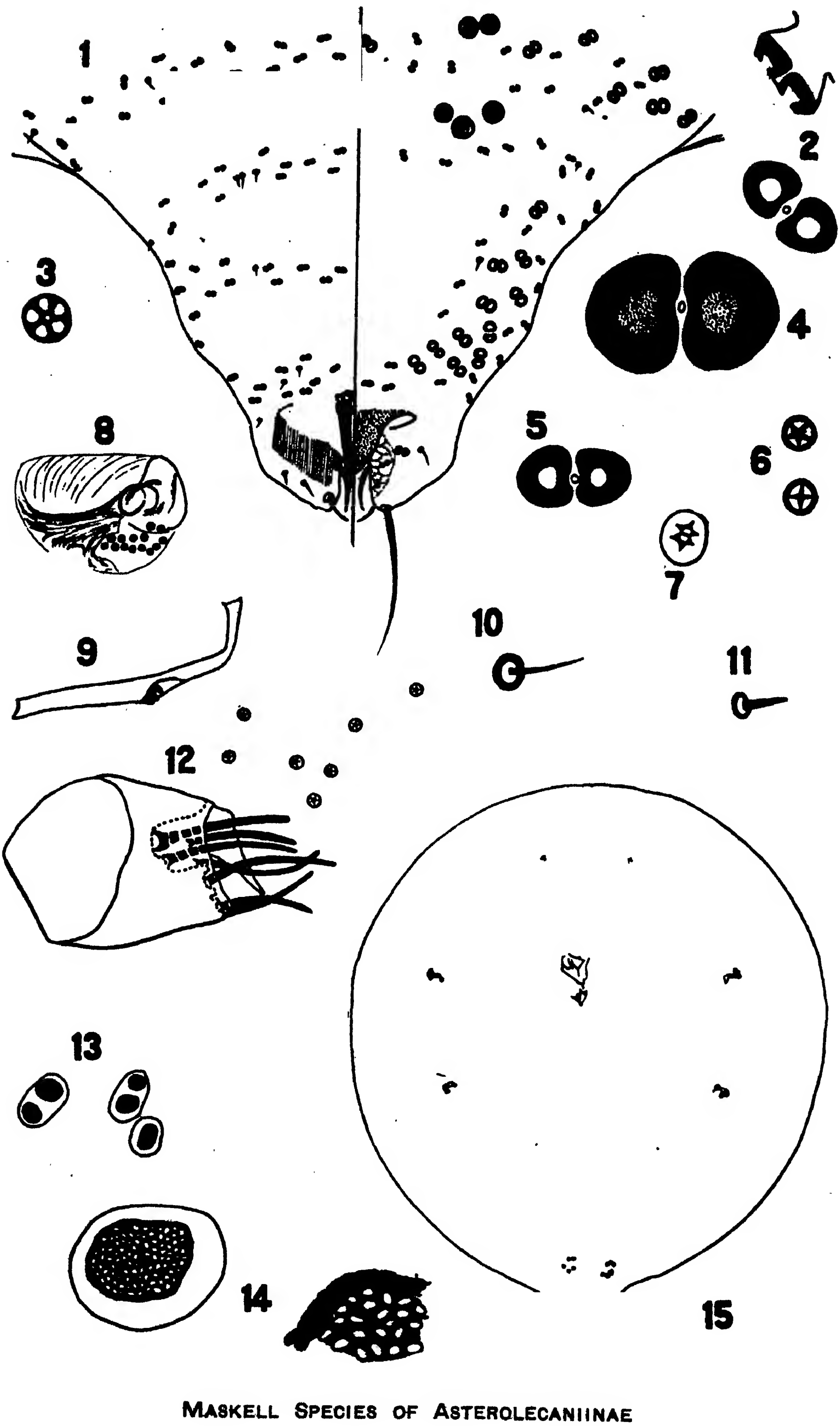


MASKELL SPECIES OF ASTEROLECANIINAE

PLATE 7

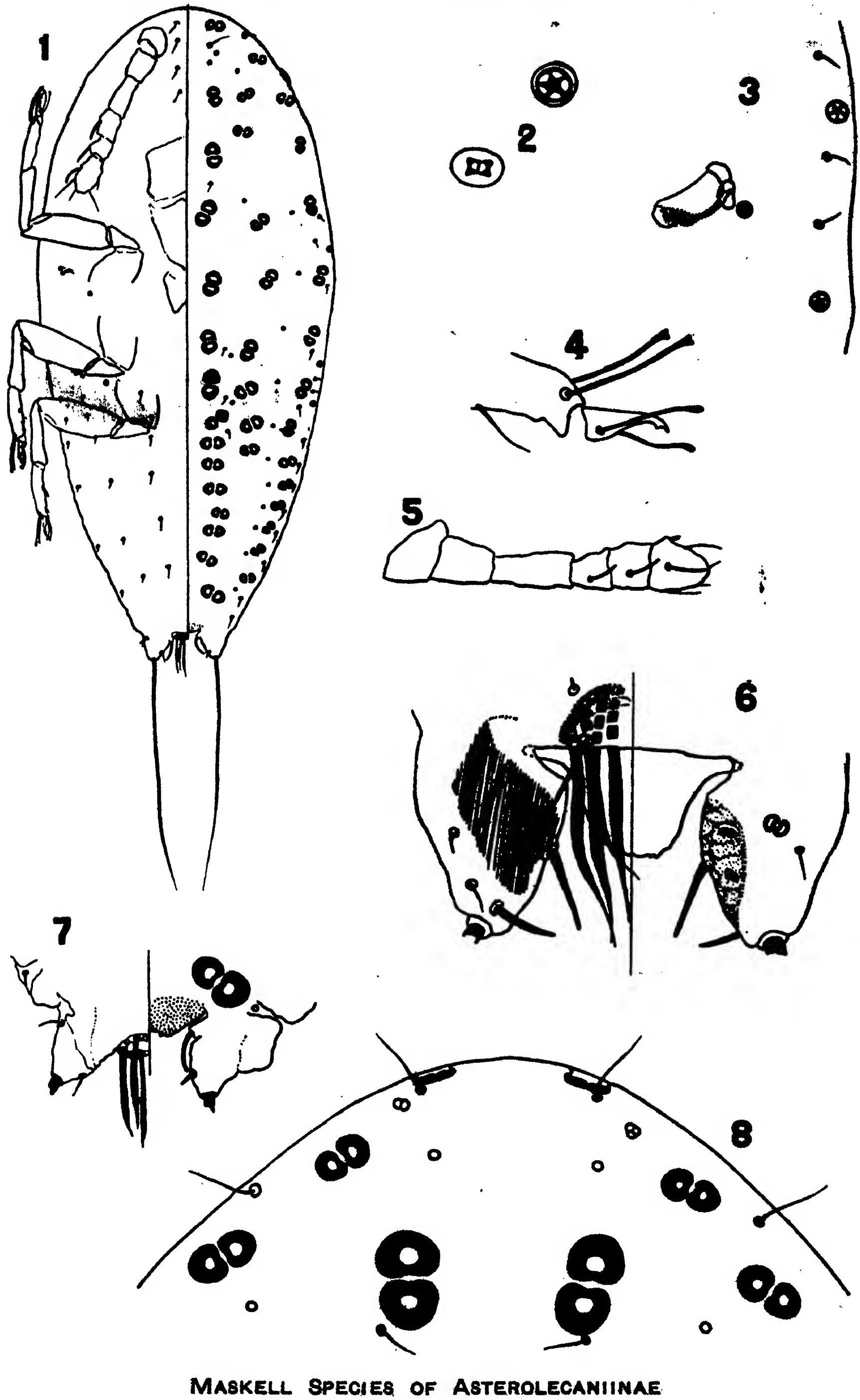
Cerococcus bryoides (Maskell), adult female.

Figure 1, apex of abdomen, dorsal and ventral, ×165; 2, dorsal smaller 8-shaped pore, two views, ×1,500; 3, spiracular quinquelocular disk pore, ×1,500; 4, largest sized 8-shaped pore, ×1,500; 5, normal ventral 8-shaped pore, ×1,500; 6, ventral quinquelocular disk pores not associated with spiracles, ×1,500; 7, ventral modified 8-shaped pore, ×1,500; 8, anterior spiracle, ×350; 9, tubular duct, ×1,500; 10, seta from the posterior ventral area of the abdomen, ×1,500; 11, seta from the anterior ventral area of the body, ×1,500; 12, antenna, ×650; 13, one of the double clusters of cribriform plates, ×230; 14, single cribriform plate, ×820, with detail of portion of same, ×1,500; 15, outline of body, optical section, ×18.

Plate 8

Cerococcus bryoides (Maskell), larva and adult female.

Figure 1, larva, dorsal and ventral, ×230; 2, larva, derm pore types, ×500; 3, larva, posterior spiracle to margin area, ×820; 4, larva, apex of tarsus, ×820; 5, larva, antenna, ×430; 6, adult female, apex of abdomen, dorsal and ventral, ×530; 7, larva, apex of abdomen, dorsal and ventral, ×820; 8, larva, anterior apex of body, dorsal, ×820.



MASKELL SPECIES OF ASTEROLECANIINAE

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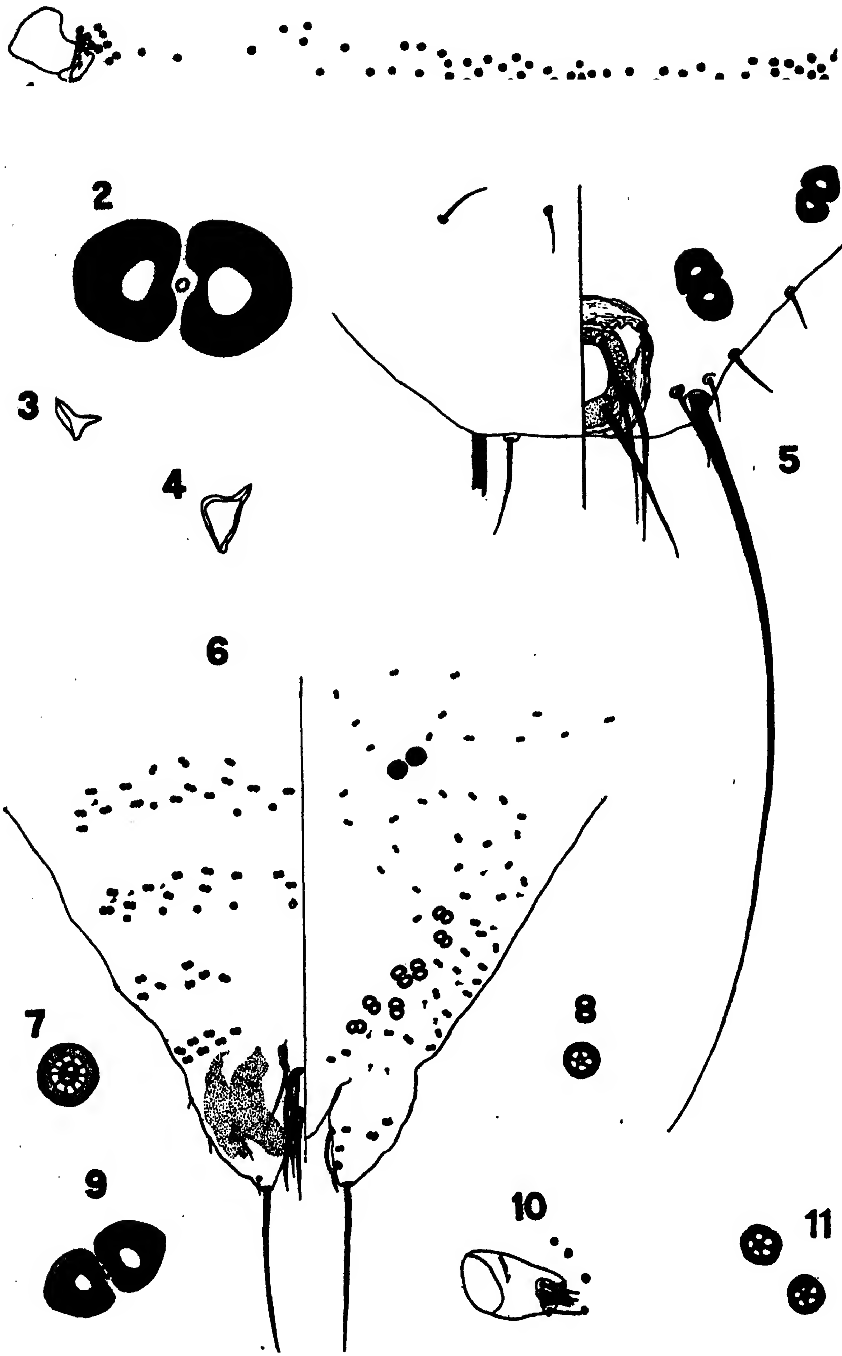


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 45

Plate 9

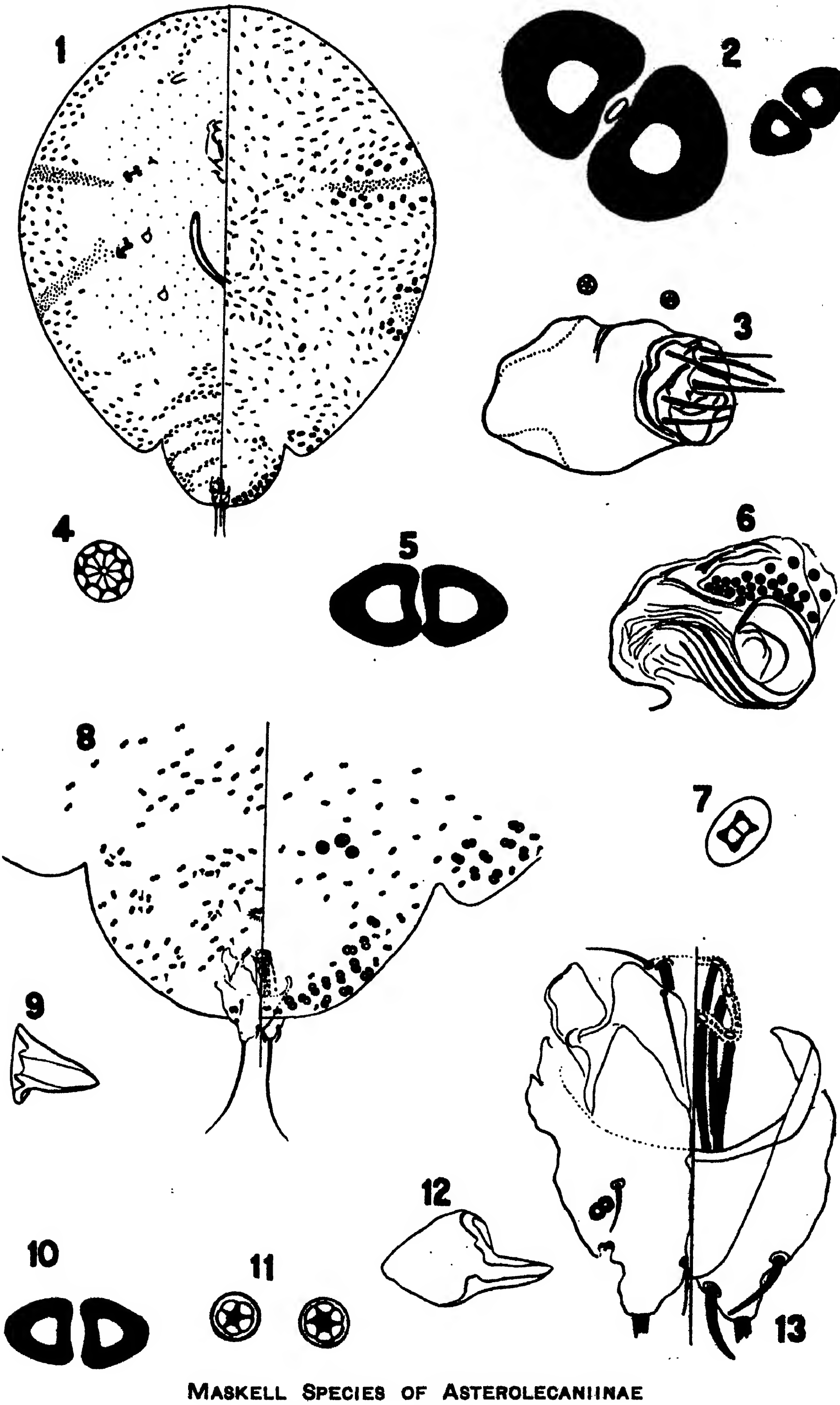
Cerococcus frogatti, new species, adult female and larva.

Figure 1, adult female, anterior spiracle to margin band of quinquelocular disk pores, ×120; 2, same, largest sized 8-shaped pore, ×1,280; 3, same, anterior leg, ×230; 4, same, posterior leg, ×230; 5, larva, apex of abdomen, dorsal and ventral, ×165; 6, adult female, apex of abdomen, dorsal and ventral, ×165; 7, same, ventral posterior abdominal multilocular disk pore, ×1,280; 8, same, antennal quinquelocular disk pore, ×1,280; 9, same, smaller sized, 8-shaped pore, ×1,280; 10, same, antenna, ×230; 11, same, spiracular quinquelocular disk pore, ×1,280.

PLATE 10

Cerococcus paradoxus (Maskell), adult female.

Figure 1, outline, dorsal and ventral, ×27; 2, dorsal 8-shaped pores, showing size variation, ×1,500; 3, antenna, ×530; 4, ventral abdominal quinquelocular disk pore, ×1,500; 5, ventral 8-shaped pore, ×1,500; 6, anterior spiracle, ×820; 7, modified ventral 8-shaped pore, ×1,500; 8, posterior apex of body, dorsal and ventral, ×90; 9, anterior leg, ×530; 10, ventral 8-shaped pore, ×1,500; 11, spiracular quinquelocular disk pores, ×1,500; 12, posterior leg, ×530; 13, anal ring, cauda, apical lobes, dorsal and ventral, ×350.



MASKELL SPECIES OF ASTEROLECANIINAE

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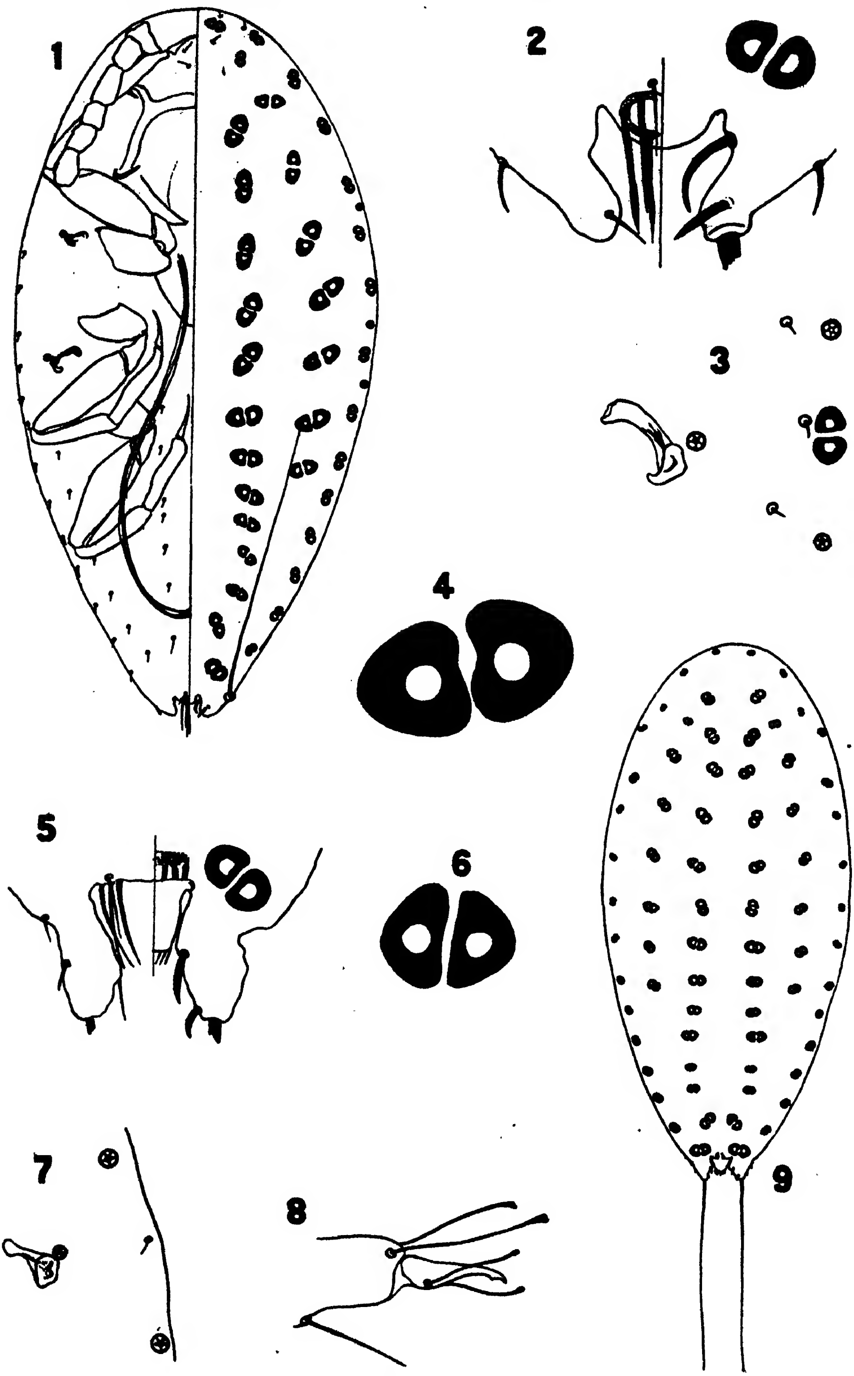


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 47

Plate 11

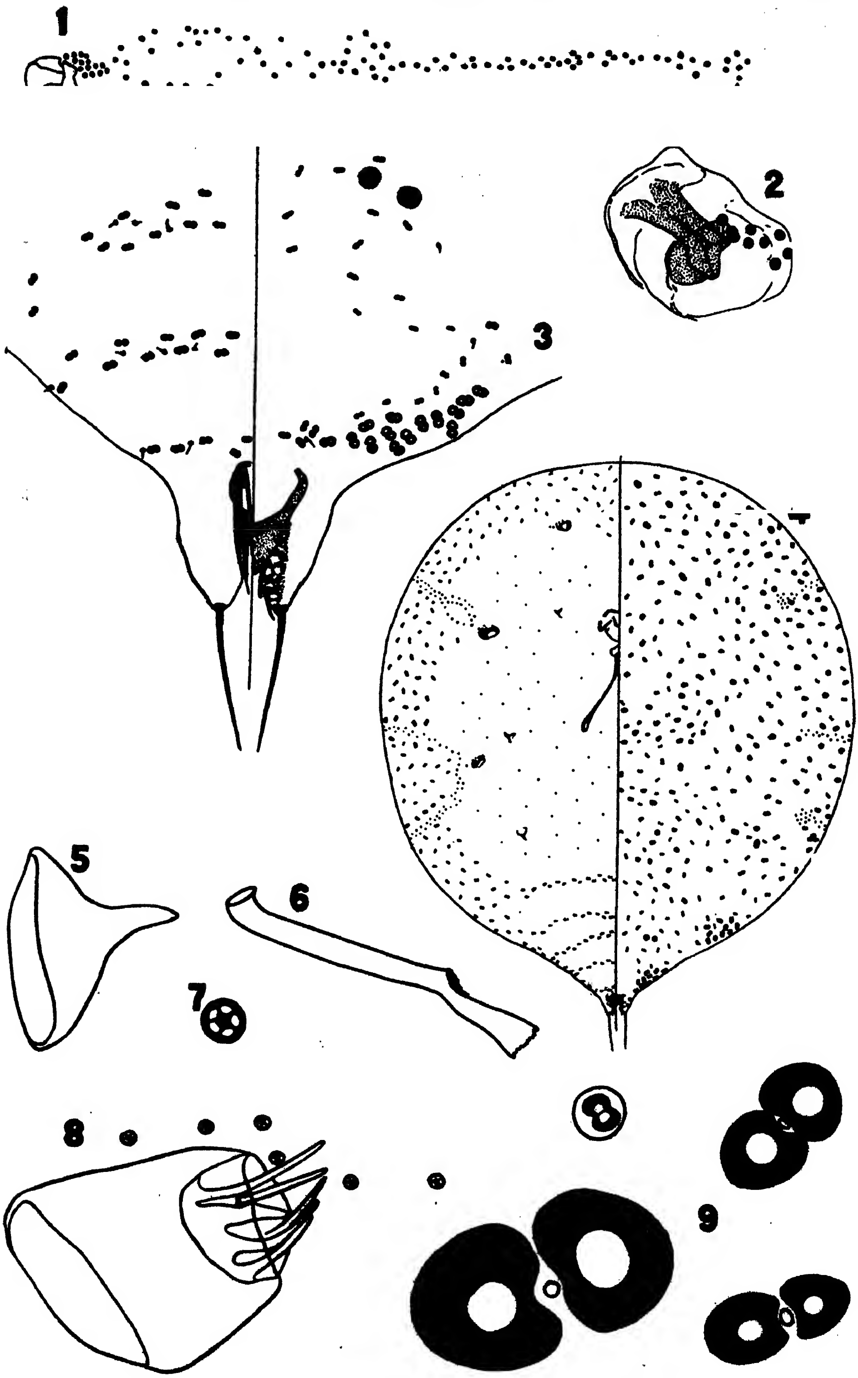
Cerococcus paradoxus (Maskell), larva, and
Cerococcus stellatus (Maskell), larva.

Figure 1, *paradoxus*, outline dorsal and ventral, ×230; 2, same, posterior apex of body, dorsal and ventral, ×820; 3, same, posterior spiracle to margin region, ×820; 4, *stellatus*, largest 8-shaped pore, ×1,500; 5, same, posterior apex of body, ×650; 6, same, smaller 8-shaped pore, ×1,500; 7, same, spiracle to margin region, ×820; 8, same, apex of tarsus, ×820; 9, same, outline, dorsal, ×180.

PLATE 12

Cerococcus stellatus (Maskell), adult female.

Figure 1, spiracle to margin pore band, ×120; 2, spiracle, ×350; 3, posterior apex of body, dorsal and ventral, ×165; 4, outline, dorsal and ventral, ×27; 5, anterior leg, ×650; 6, tubular duct, ×1,500; 7, spiracular quinquelocular disk pore, ×1,500; 8, antenna with adjacent pores, ×650; 9, variations in 8-shaped pores, ×1,500.



MASKELL SPECIES OF ASTEROLECANIINAE

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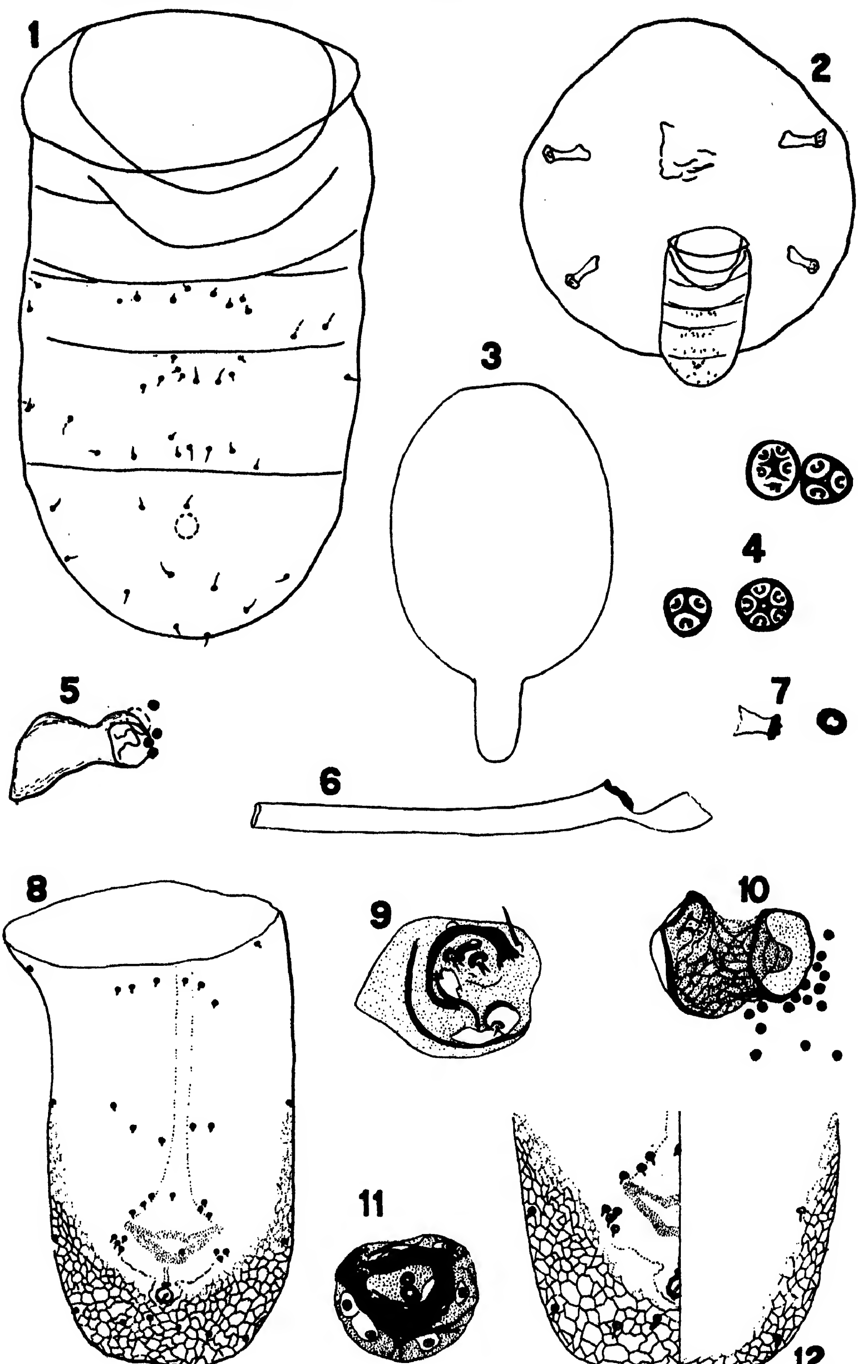


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 49

Plate 13

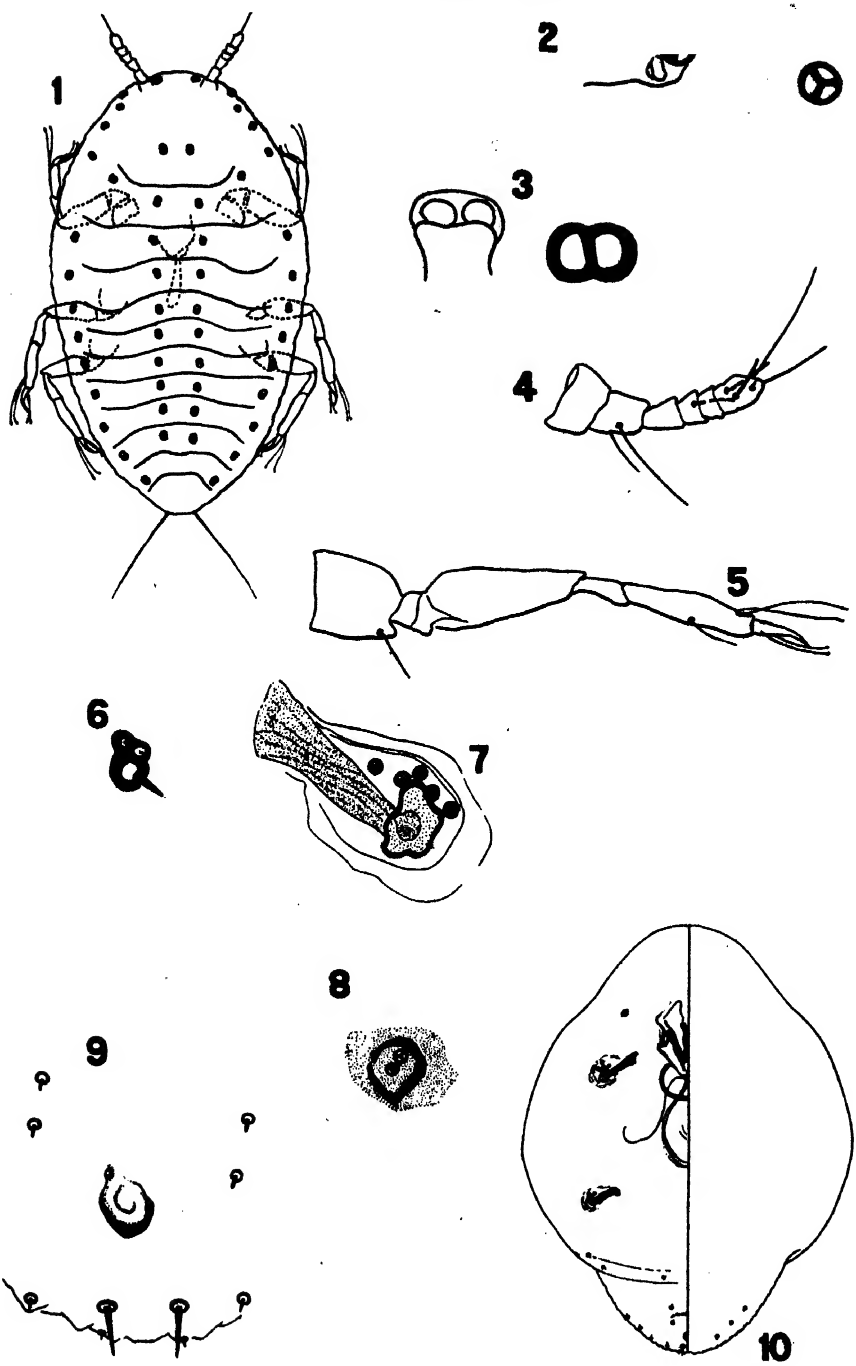
Frenchia semiocculta Maskell, adult female.

Figure 1, produced apex of abdomen, or "tail," from Maskell slide, ×230; 2, outline of body, optical section, from Maskell slide, ×60; 3, outline of body, from cotype specimen, ×27; 4, types of derm disk pores, ×1,500; 5, spiracle, from Maskell slide, ×230; 6, tubular duct, ×1,500; 7, modified 8-shaped pore, ×1,500; 8, apex of abdomen or "tail," from cotype specimen, ×180; 9, antenna, from cotype specimen, ×820; 10, spiracle, from cotype specimen, ×230; 11, another antenna, ×820; 12, apex of "tail," dorsal and ventral, ×230.

PLATE 14

Frenchia semiocculta Maskell, larva and intermediate stage.

Figure 1, larva, outline, dorsal, ×165; 2, larva, spiracle and adjacent pore, ×1,280; 3, larva, 8-shaped pore, two views, ×1,280; 4, larva, antenna, ×430; 5, larva, leg, ×430; 6, intermediate female, pore and seta near posterior spiracle, ×1,500; 7, same, anterior spiracle, ×530; 8, same, antenna, ×820; 9, same, posterior apex of body, ×530; 10, same, outline, dorsal and ventral, ×90.



MASKELL SPECIES OF ASTEROLECANIINAE

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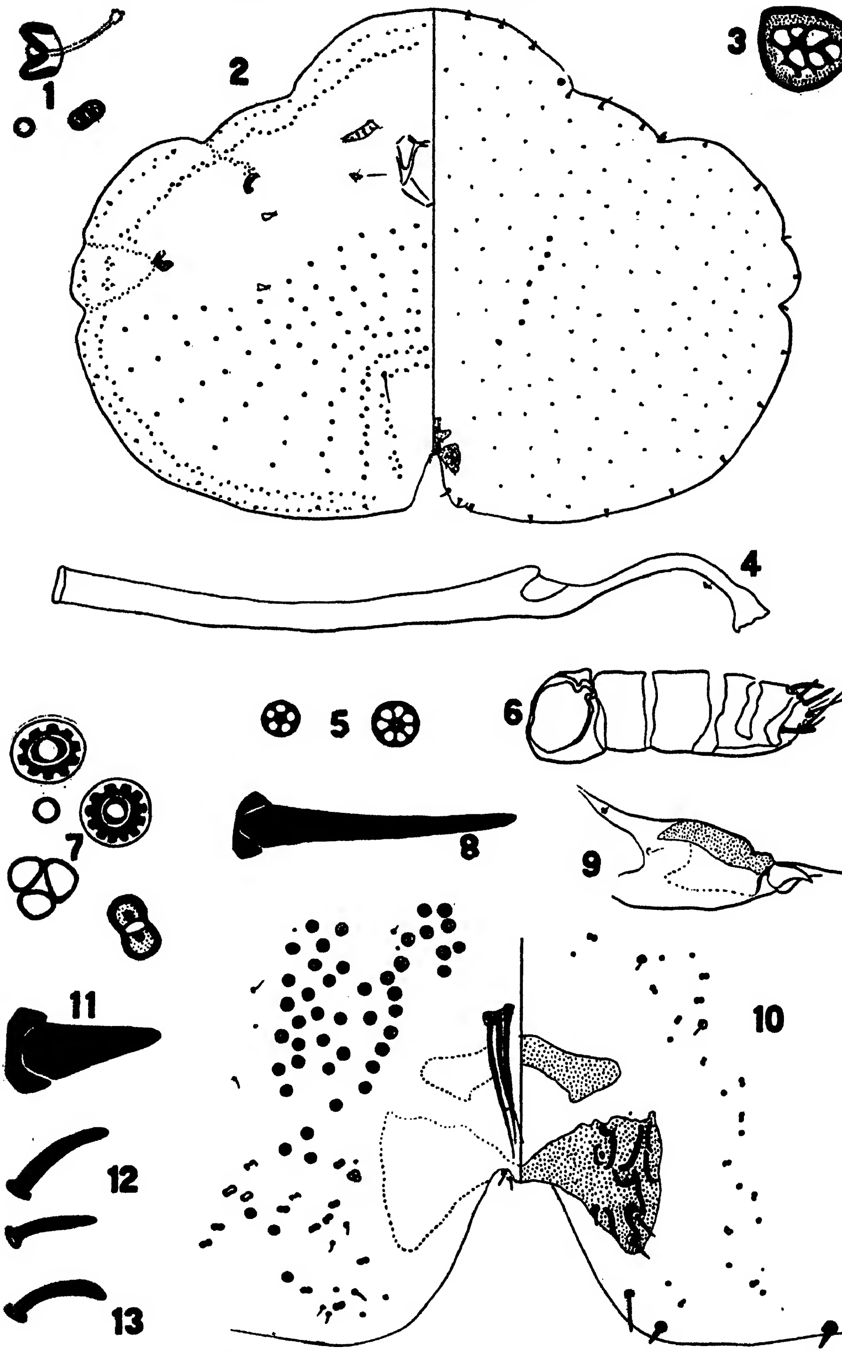


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 51

PLATE 15

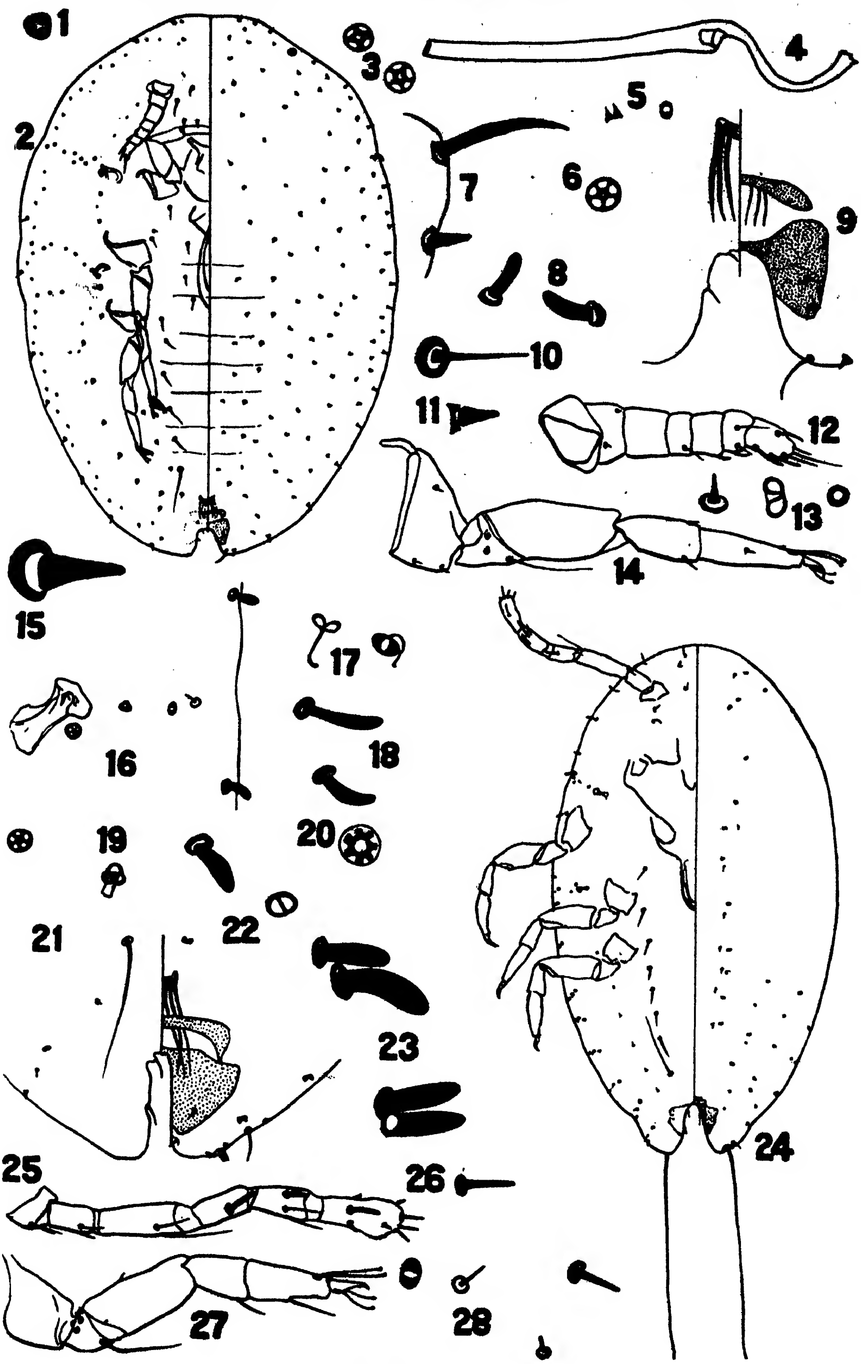
Lecaniodiaspis acaciae (Maskell), adult female.

Figure 1, types of dorsal derm pores, ×1,500; 2, outline of old adult female, dorsal and ventral, ×60; 3, single cribriform plate, ×1,500; 4, tubular duct, ×1,500; 5, spiracular multilocular disk pores, ×1,500; 6, antenna, ×350; 7, types of posterior ventral abdominal derm pores, ×1,500; 8, apical seta, ×1,500; 9, middle leg, ×350; 10, posterior apex of body, dorsal and ventral, ×230; 11, marginal seta, ×1,500; 12, anterior apiracular spines, ×350; 13, cephalad posterior spiracular spine, ×350.

PLATE 16

Lecaniodiaspis acaciae (Maskell), second stage female and larva.

Figure 1, second stage female, modified ventral disk pore, ×1,500; 2, same, outline, dorsal and ventral, ×90; 3, same, spiracular quinquelocular disk pores, ×1,500; 4, same, tubular duct, ×1,500; 5, same, modified ventral 8-shaped pore, ×1,500; 6, same, identical with 3; 7, same, apical and preapical setae, ×820; 8, same, posterior spiracular spines, ×820; 9, same, anal region, dorsal and ventral, ×350; 10, same, dorsal seta, ×1,500; 11, same, marginal seta, ×820; 12, same, antenna, ×230; 13, same, dorsal posterior seta and pores, ×1,500; 14, same, leg, ×230; 15, same, anterior marginal seta, ×1,500; 16, larva, posterior spiracle to margin, ×820; 17, larva, 8-shaped pore, ×1,500; 18, second stage female, anterior spiracular spines, ×820; 19, larva, posterior spiracular spine and pores connected with fig. 16, ×1,500; 20, larva, disk pore from anterior spiracular region, ×1,500; 21, larva, apex of abdomen, dorsal and ventral, ×530; 22, larva, dorsal posterior 8-shaped pore, ×1,500; 23, larva, two sets of antèrior spiracular spines, ×1,500; 24, larva, outline, dorsal and ventral, ×165; 25, larva, antenna, ×350; 26, larva, marginal seta, ×1,500; 27, larva, leg, ×350; 28, larva, pore and setae, ×1,500.



MASKELL SPECIES OF ASTEROLECANIINAE

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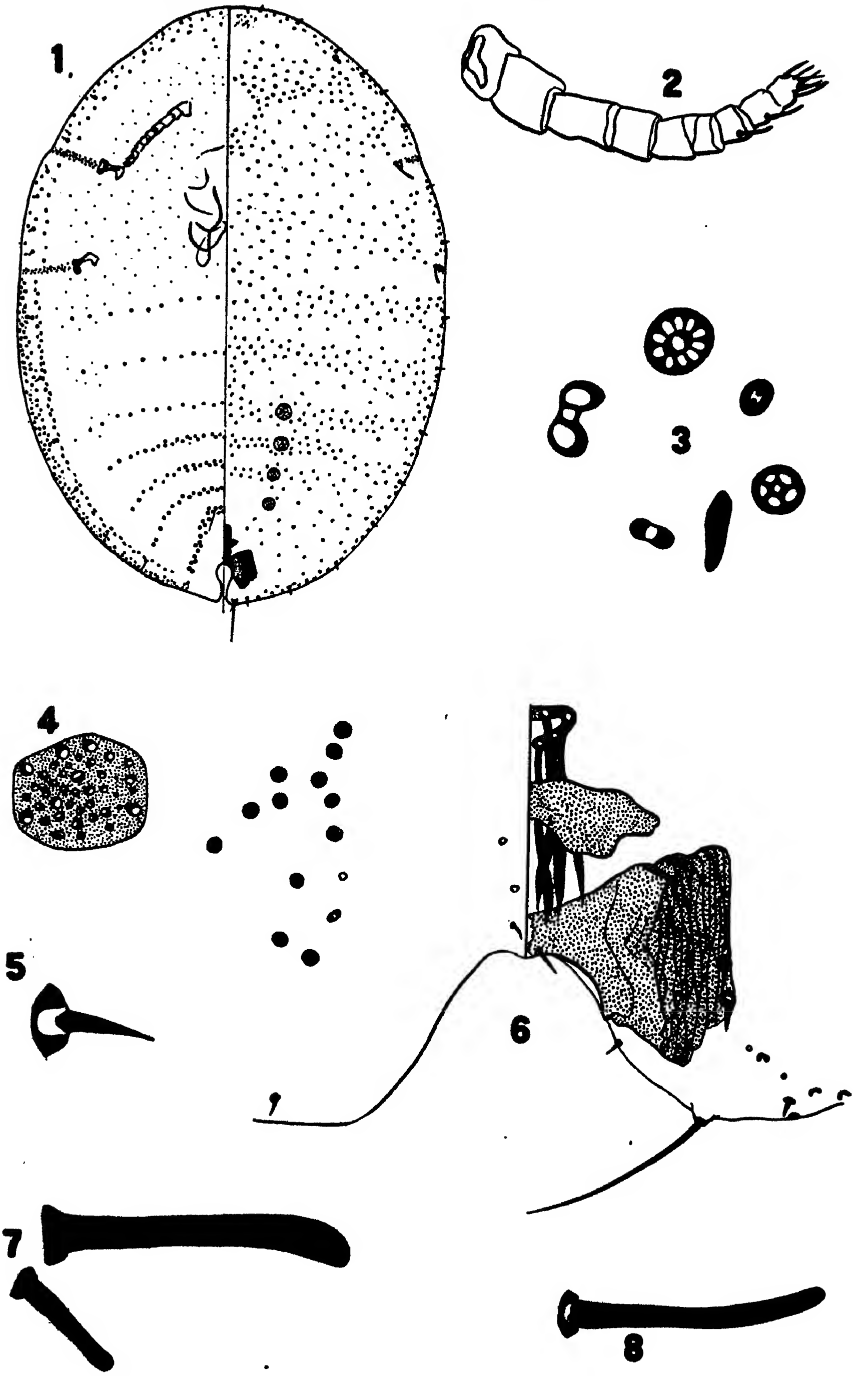


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 53

PLATE 17

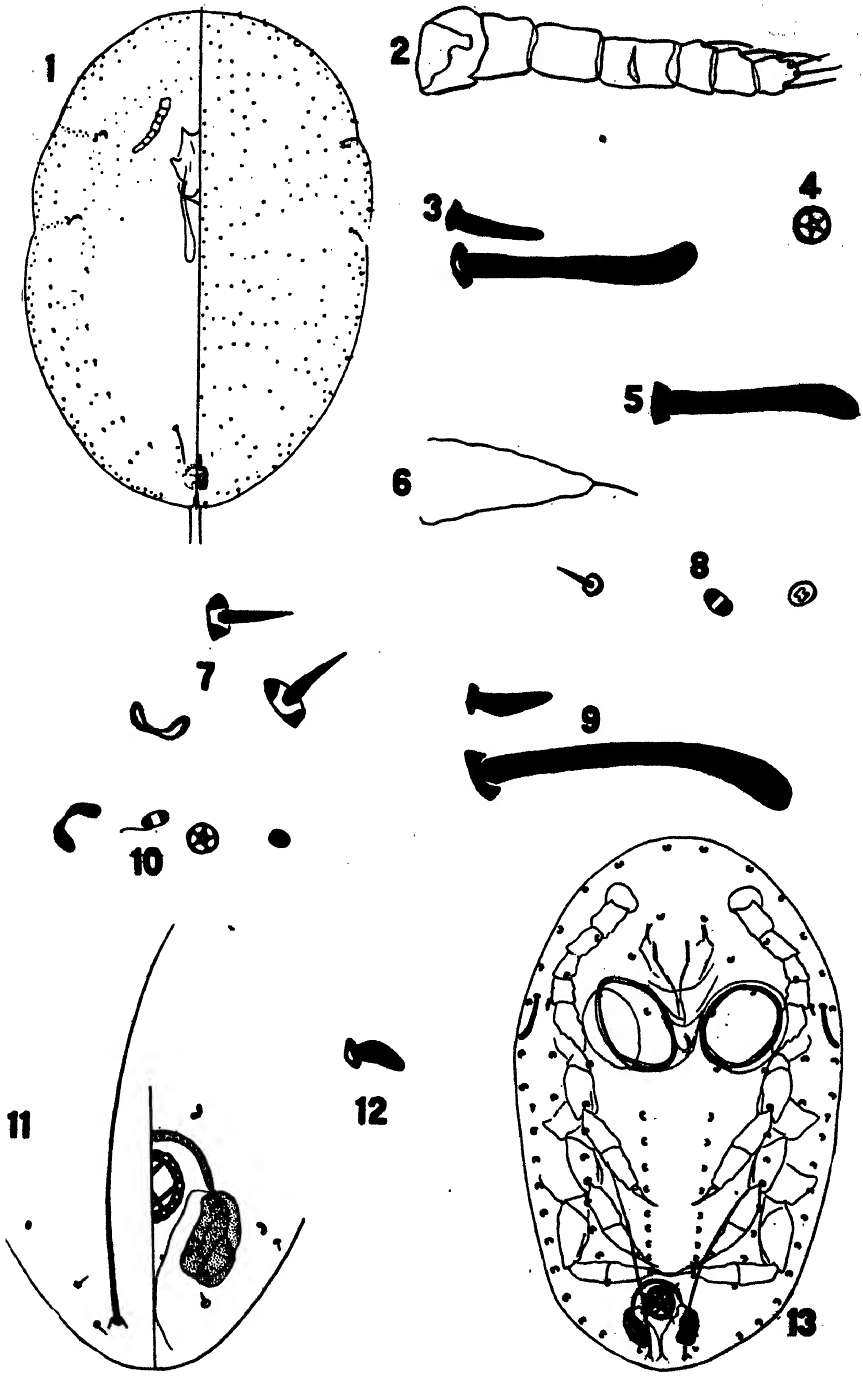
Lecaniodiaspis atherospermae (Maskell), adult female.

Figure 1, outline, dorsal and ventral, ×60; 2, antenna, ×230; 3, types of derm pores, ×1,500; 4, single cribriform plate, ×530; 5, dorsal seta, ×1,500; 6, posterior apex of body, dorsal and ventral, ×230; 7, anterior spiracular spines, ×530; 8, posterior spiracular spine, ×530.

PLATE 18

Lecaniodiaspis atherospermae (Maskell), preadult female and larva.

Figure 1, larva, outline, ×60; 2, same, antenna, ×350; 3, same, anterior spiracular spines, ×820; 4, same, spiracular quinquelocular disk pore, ×1,500; 5, same, posterior spiracular spine, ×820; 6, same, leg, ×530; 7, same, dorsal 8-shaped pore and marginal setae, ×1,500; 8, same, ventral 8-shaped pores and seta, ×1,500; 9, larva, anterior spiracular spines, ×1,500; 10, larva, types of derm pores, ×1,500; 11, larva, apex of abdomen, dorsal and ventral, ×530; 12, larva, posterior spiracular spine, ×1,500; 13, larva, outline optical section, ×230.



MASKELL SPECIES OF ASTEROLECANIINAE

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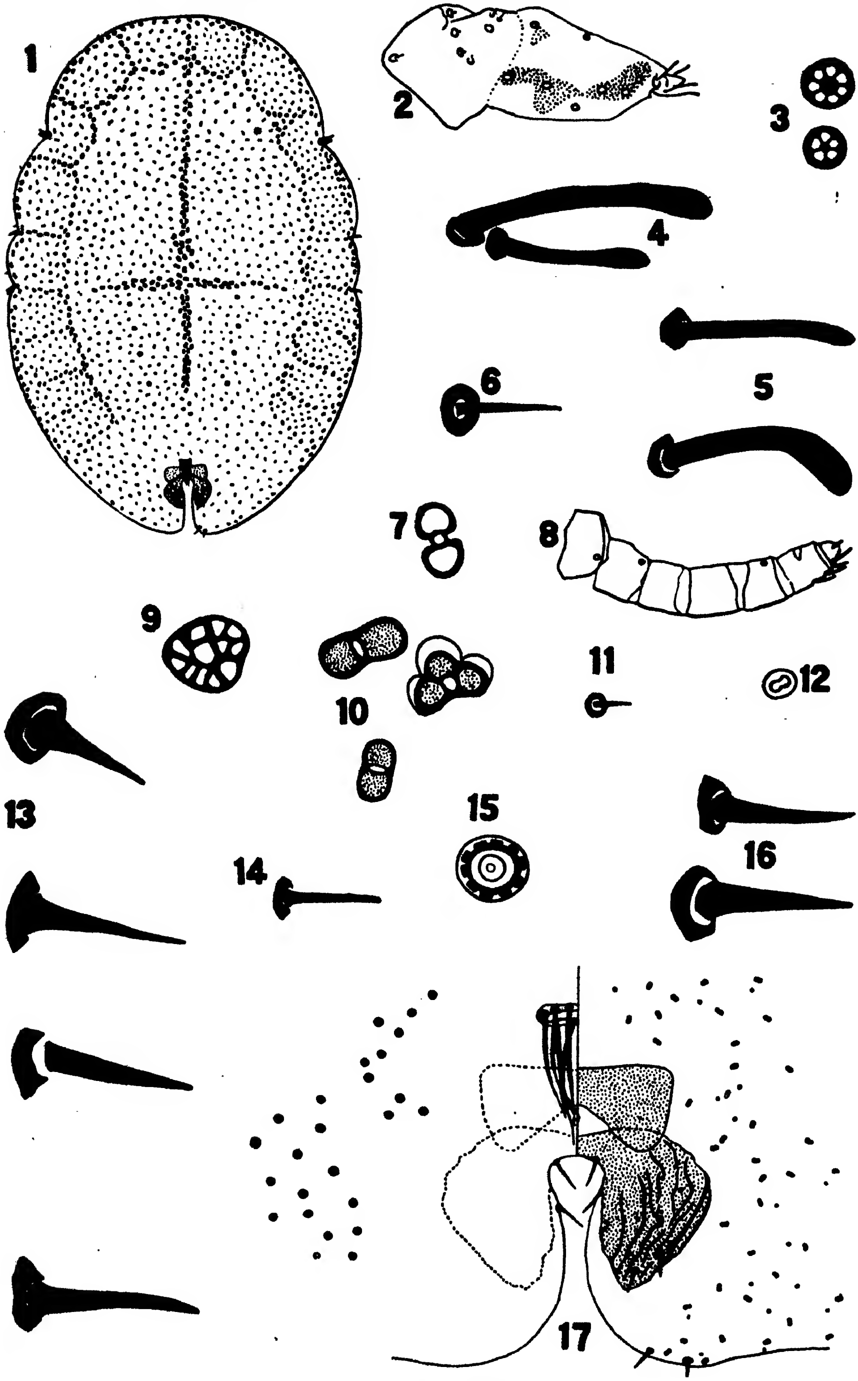


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 55

PLATE 19

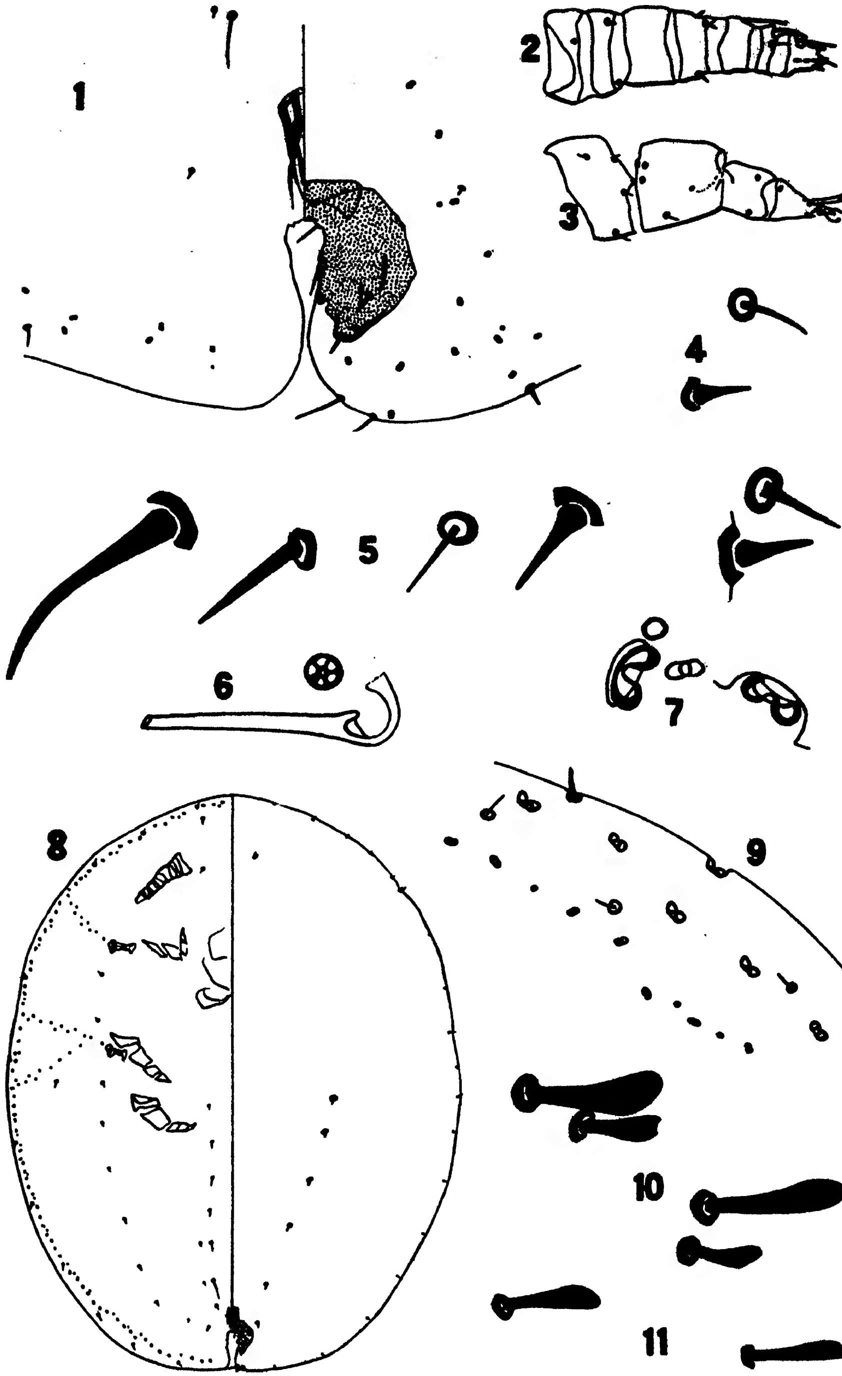
Lecaniodiaspis eucalypti (Maskell), adult female.

Figure 1, outline, dorsal, early adult, showing arrangement of 8-shaped pores, ×60; 2, posterior leg, ×530; 3, spiracular disk pores, ×1,500; 4, anterior spiracular spines, ×820; 5, the two isolated posterior spiracular spines, ×320; 6, dorsal seta, ×1,500; 7, small dorsal 8-shaped pore, ×1,500; 8, antenna, × 230; 9, single cribriform plate, ×1,500; 10, normal (below) and enlarged (above) dorsal 8-shaped pores, freak to right, all ×1,500; 11, derm spine, ×1,500; 12, modified ventral 8-shaped pore, ×1,500; 13, series of posterior marginal setae, the apical below, all ×1,500; 14, anterior marginal seta, ×1,500; 15, ventral abdominal multilocular disk pore, ×1,500; 16, another set of apical and preapical setae, ×1,500; 17, posterior apex of body, dorsal and ventral, ×230.

PLATE 20

Lecaniodiaspis eucalypti (Maskell), preadult female.

Figure 1, posterior apex of body, dorsal and ventral, ×350; 2, antenna, ×350; 3, leg, ×350; 4, marginal and submarginal setae anterior to spiracular spines, ×1,500; 5, series of marginal and submarginal setae, with apical and preapical to left, ×1,500; 6, spiracular quinquelocular disk pore and dorsal tubular duct, ×1,500; 7, types of 8-shaped and simple derm pores, ×1,500; 8, outline, dorsal and ventral, ×90; 9, margin of body near antenna, ×530; 10, two sets of anterior spiracular spines, ×820; 11, a pair of separated posterior spiracular spines, the anterior one to the left, ×820.



MASKELL SPECIES OF ASTEROLECANIINAE

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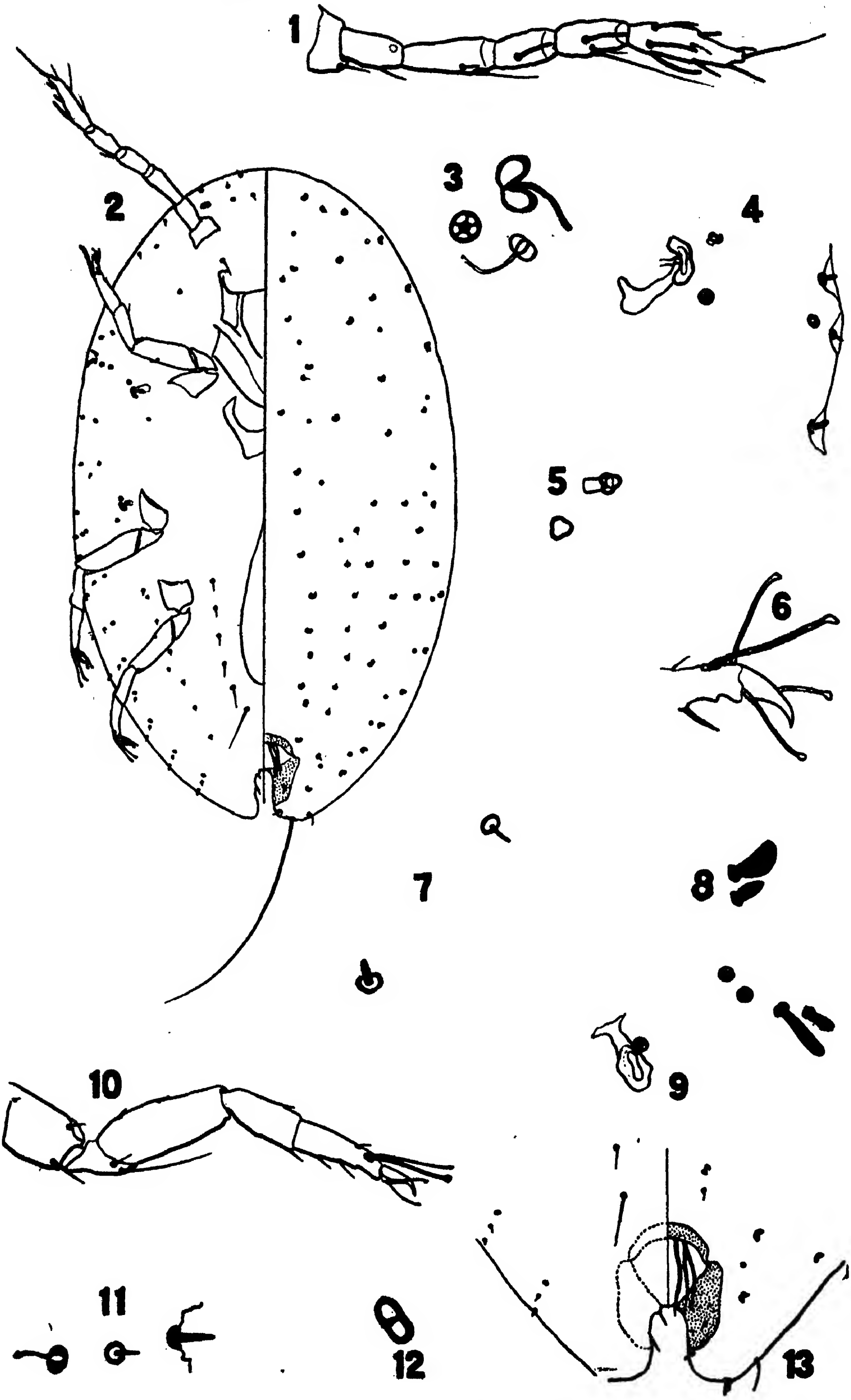


MASKELL SPECIES OF ASTEROLECANIINAE

PLATE 21

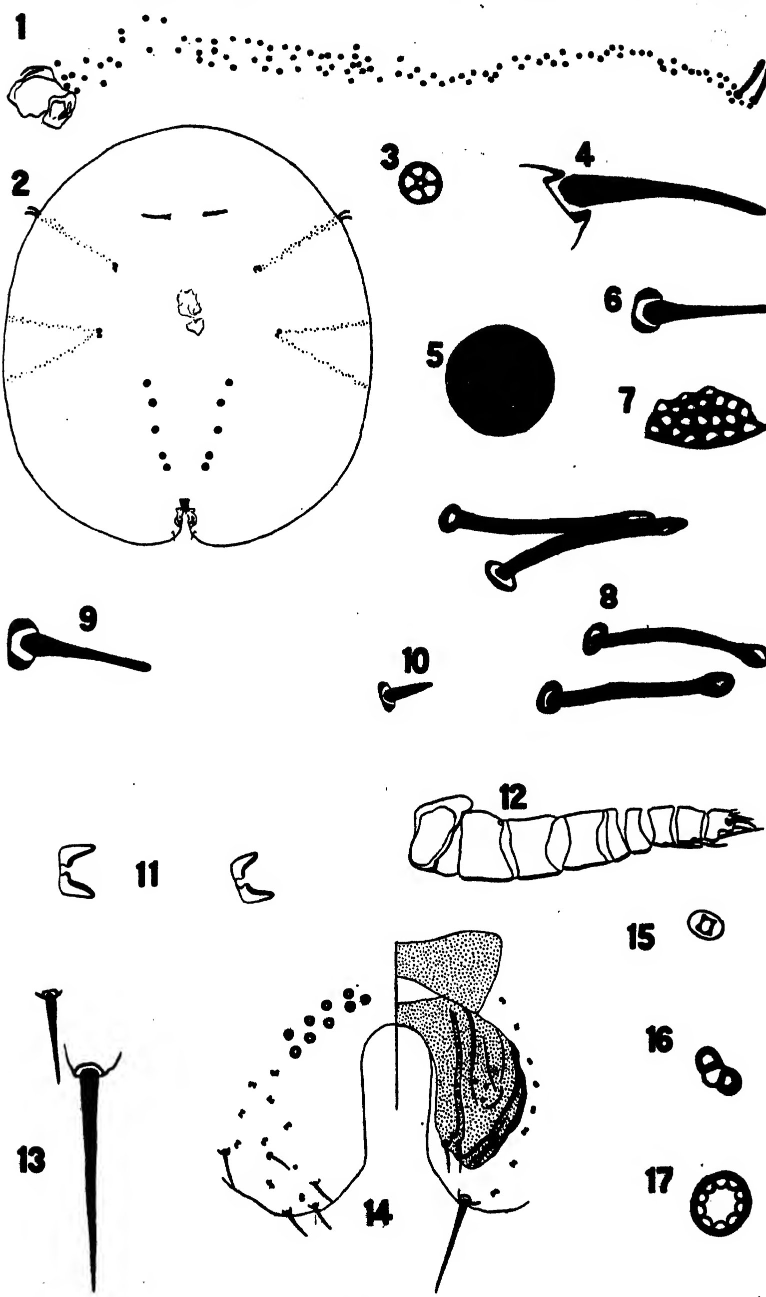
Lecaniodiaspis eucalypti (Maskell), larva.

Figure 1, antenna, ×345; 2, outline, dorsal and ventral, ×165; 3, quinquelocular and 8-shaped derm pores, ×1,500; 4, posterior spiracle to body margin region, ×530; 5, type of ventral derm pore, ×1,500; 6, apex of leg, ×530; 7, marginal and dorsal setae, ×1,500; 8, anterior spiracular spines, ×720; 9, anterior spiracle to body margin region, showing variation in shape of marginal spines, ×720; 10, leg, ×345; 11, ventral 8-shaped pore, submarginal and marginal setae, ×1,500; 12, dorsal 8-shaped pore, ×1,500; 13, posterior apex of body, dorsal and ventral, ×345.

Plate 22

Lecaniodiaspis mimosae (Maskell), adult female.

Figure 1, spiracle to margin quinquelocular pore band, ×120; 2, outline, optical section, ×18; 3, spiracular quinquelocular disk pore, ×1,500; 4, marginal seta, ×1,500; 5, single cribriform plate, ×530; 6, submarginal seta, ×1,500; 7, portion of cribriform plate, ×1,500; 8, two sets of anterior spiracular spines, ×430; 9, marginal seta, ×1,500; 10, ventral seta, ×1,500; 11, 8-shaped pores, ×1,500; 12, antenna, ×230; 13, apical and subapical setae, ×530; 14, anal region, dorsal and ventral, ×230; 15, modified ventral 8-shaped pore, ×1,500; 16, ventral 8-shaped pore, ×1,500; 17, ventral posterior abdominal disk pore, ×1,500.



MASKELL SPECIES OF ASTEROLECANIINAE

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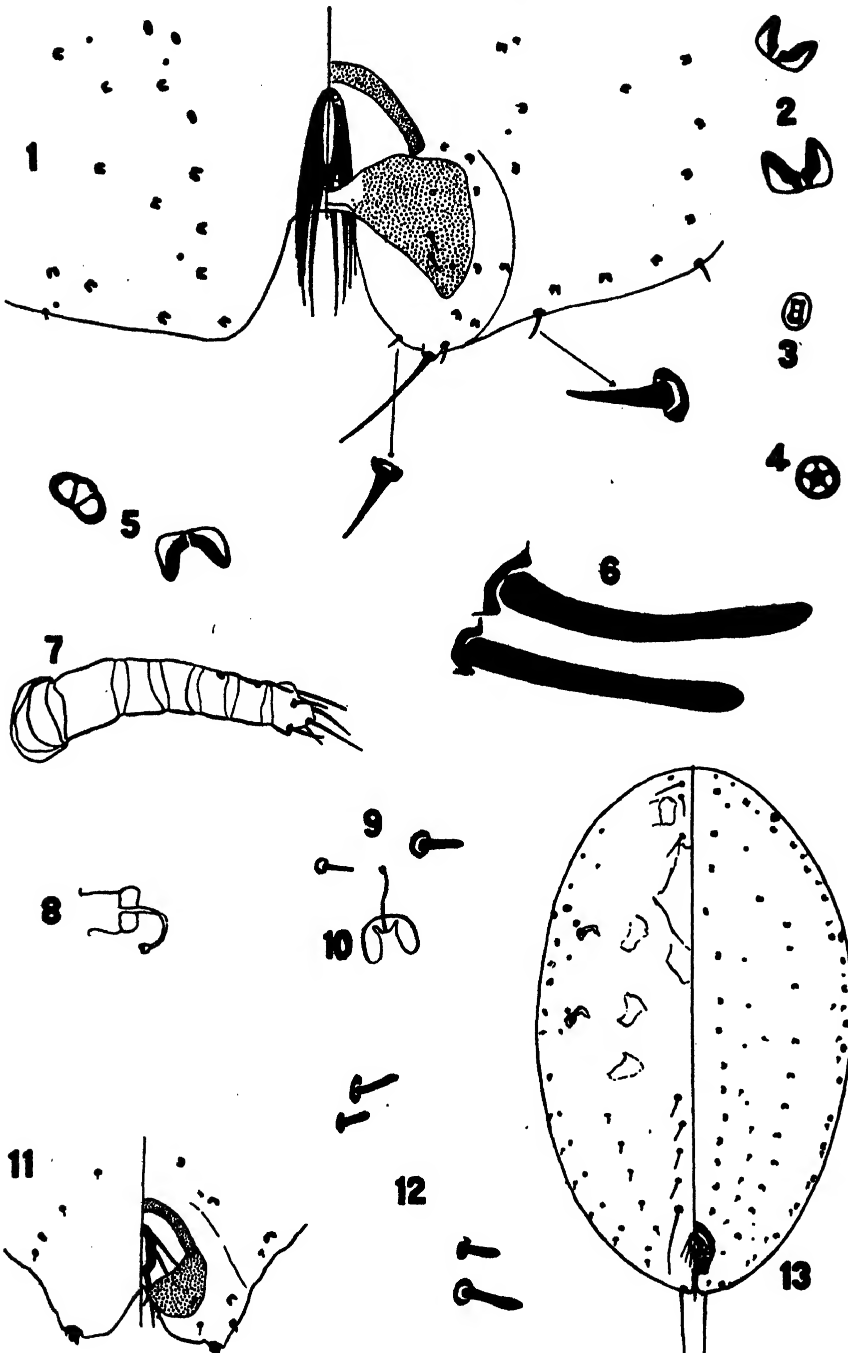


MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 59

Plate 23

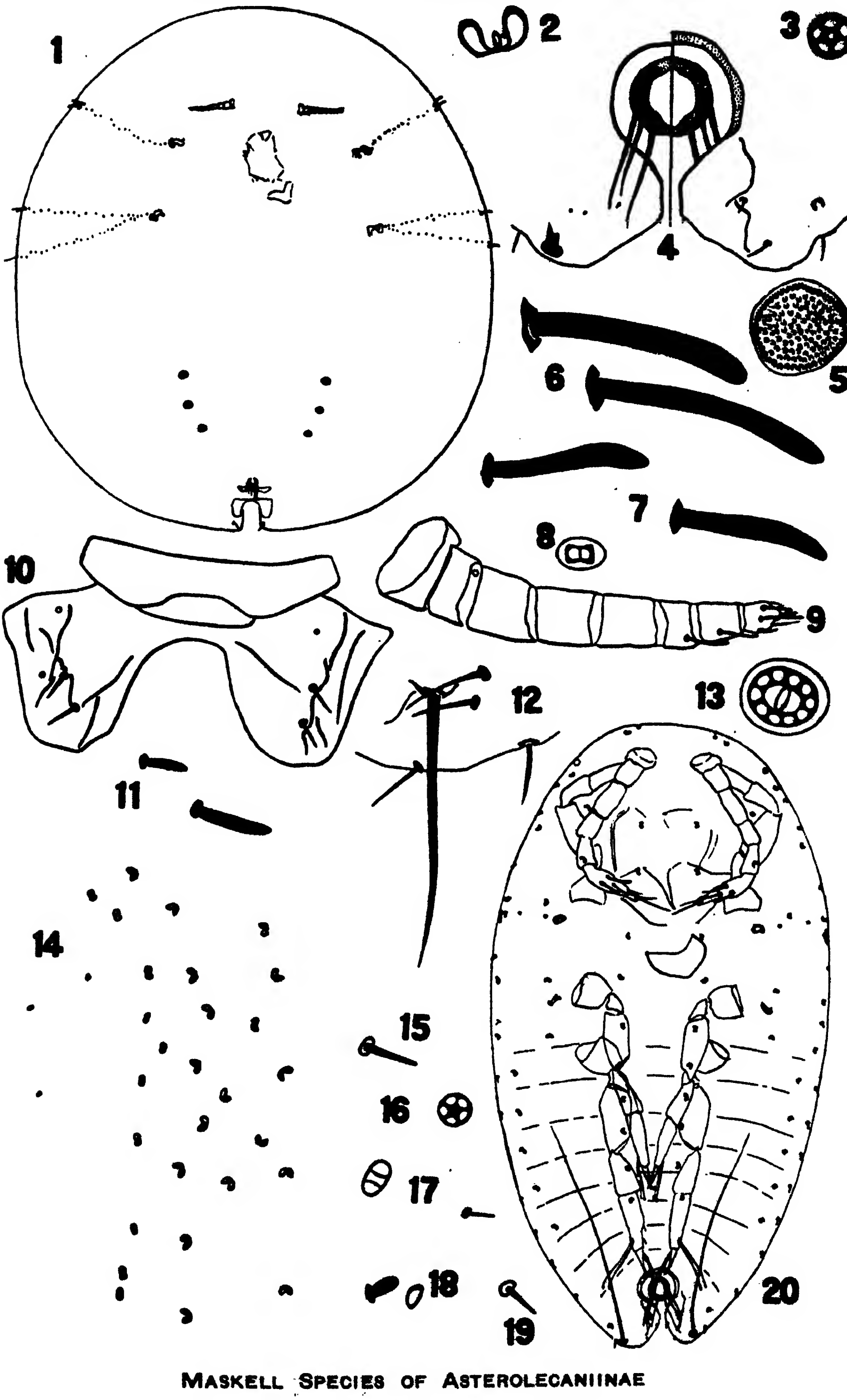
Lecaniodiaspis mimosae (Maskell), preadult and larva.

Figure 1, preadult female, apex of abdomen, dorsal and ventral, ×350; 2, same, 8-shaped pores, dorsal, ×1,500; 3, same, modified ventral 8-shaped pore, ×1,500; 4, same, spiracular quinquelocular disk pore, ×1,500; 5, same, normal ventral 8-shaped pore, two views, ×1,500; 6, same, anterior spiracular spines, ×1,500; 7, same, antenna, ×350; 8, larva, 8-shaped pore, side, ×1,500; 9, same, marginal and dorsal setae, ×1,500; 10, same, 8-shaped pore, as with Figure 8, ×1,500; 11, same, apex of abdomen, dorsal and ventral, ×350; 12, same, anterior spiracular spines, ×1,500; 13, same, outline, dorsal and ventral, ×165.

Plate 24

Lecaniodiaspis prosopidis (Maskell), adult female and larva.

Figure 1, adult female, outline, optical section, ×27; 2, same, dorsal 8-shaped pore, ×1,500; 3, same, spiracular quinquelocular disk pore, ×1,500; 4, larva, apex of abdomen, dorsal and ventral, ×530; 5, adult female, single cribriform plate, ×530; 6, same, anterior spiracular spines, ×650; 7, same, posterior spiracular spines, the anterior to the left, ×650; 8, same, ventral modified 8-shaped pore, ×1,500; 9, same, antenna, ×230; 10, same, anal pseudoplates, from Maskell slide, ×230; 11, larva, anterior spiracular spines, ×1,500; 12, adult female, apical and adjacent setae, ×530; 13, same, ventral abdominal multilocular disk pore, ×1,500; 14, same, showing arrangement of 8-shaped pores at body margin, ventral to left, dorsal to right, ×230; 15, larva, marginal seta, ×1,500; 16, larva, spiracular quinquelocular disk pore, ×1,500; 17, larva, ventral 8-shaped pore and seta, ×1,500; 18, larva, anterior spiracular spines (one broken off), ×1,500; 19, larva, seta opposite posterior spiracle, ×1,500; 20, larva, outline, ventral, ×165.



MASKELL SPECIES OF ASTEROLECANIINAE

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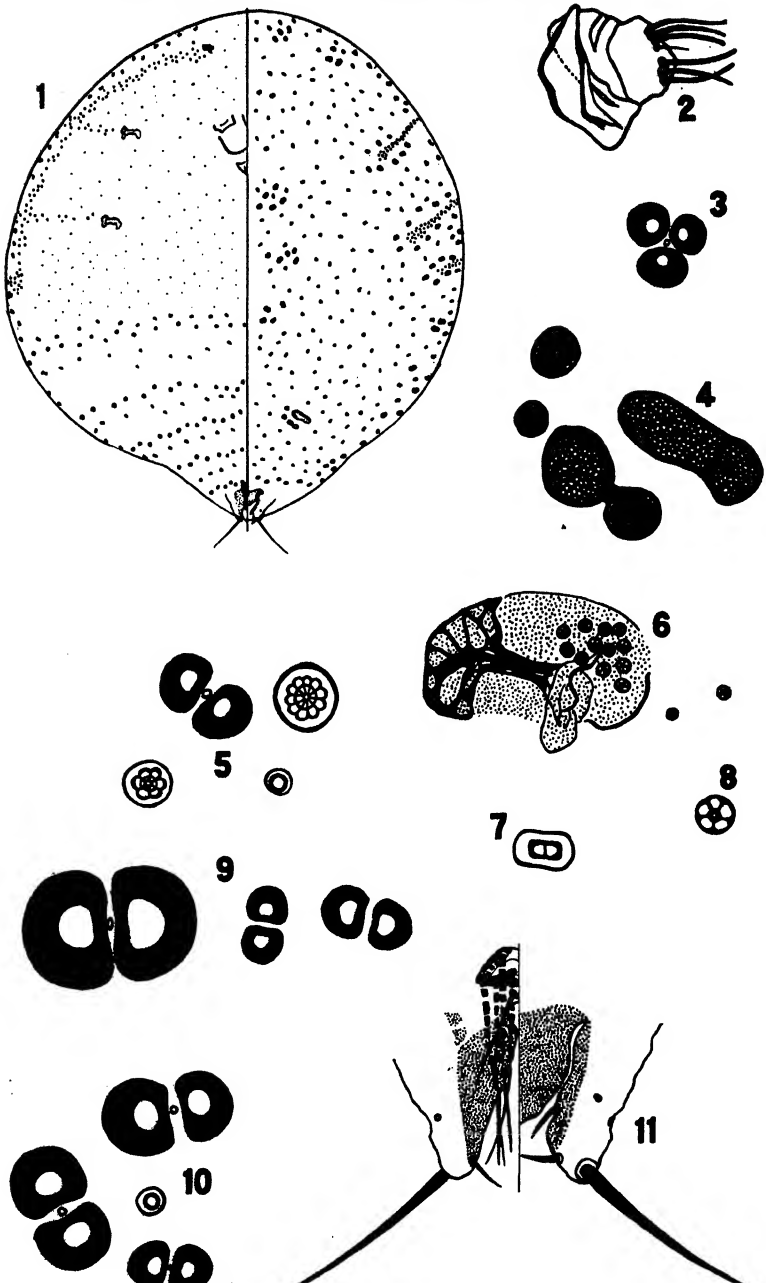

MASKELL SPECIES OF ASTEROLECANIINAE

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PLATE 25

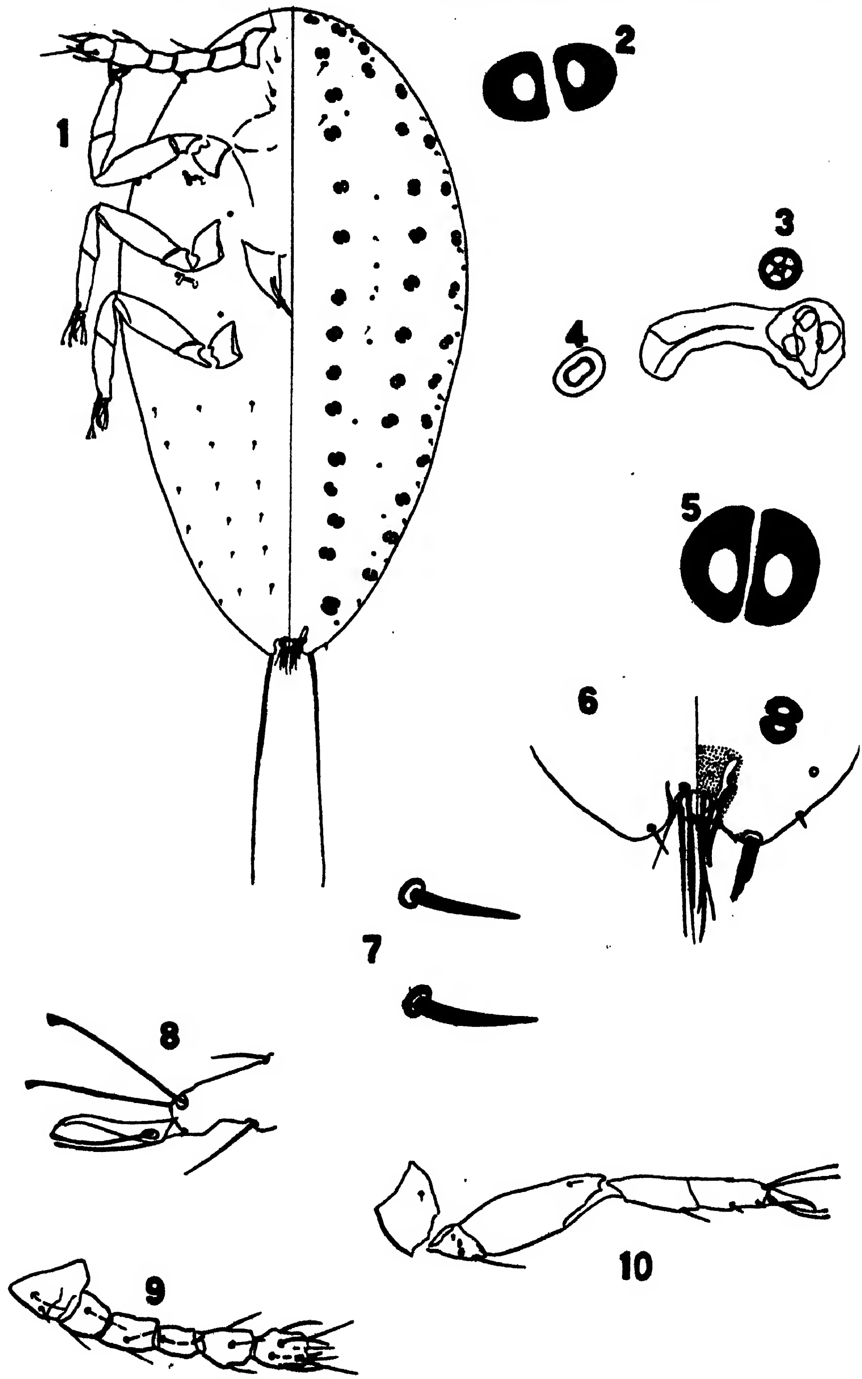
Solenococcus corokiae (Maskell) adult female.

Figure 1, outline, dorsal and ventral, ×60; 2, antenna, ×530; 3, freak 8-shaped pore, ×1,500; 4, groups of cribriform plates from one side of body, ×530; 5, types of derm pores, ×1,500; 6, spiracle, ×530; 7, modified ventral 8-shaped pore, ×1,500; 8, spiracular quinquelocular disk pore, ×1,500; 9, 8-shaped pores from mid-dorsal area, ×1,500; 10, 8-shaped and simple pores from posterior dorsal area, ×1,500; 11, tip of abdomen, showing lobes and cauda, dorsal, and ventral, ×350.

PLATE 26

Solenococcus corokiae (Maskell), larva.

Figure 1, outline, dorsal and ventral, ×230; 2, anterior 8-shaped pore, ×1,500; 3, spiracle and adjacent pore, ×1,500; 4, modified ventral 8-shaped pore, ×1,500; 5, posterior 8-shaped pore, ×1,500; 6, apex of abdomen, dorsal and ventral, ×530; 7, marginal setae, ×1,500; 8, apex of tarsus, ×530; 9, antenna, ×350; 10, leg, ×350.



MASKELL SPECIES OF ASTEROLECANIINAE

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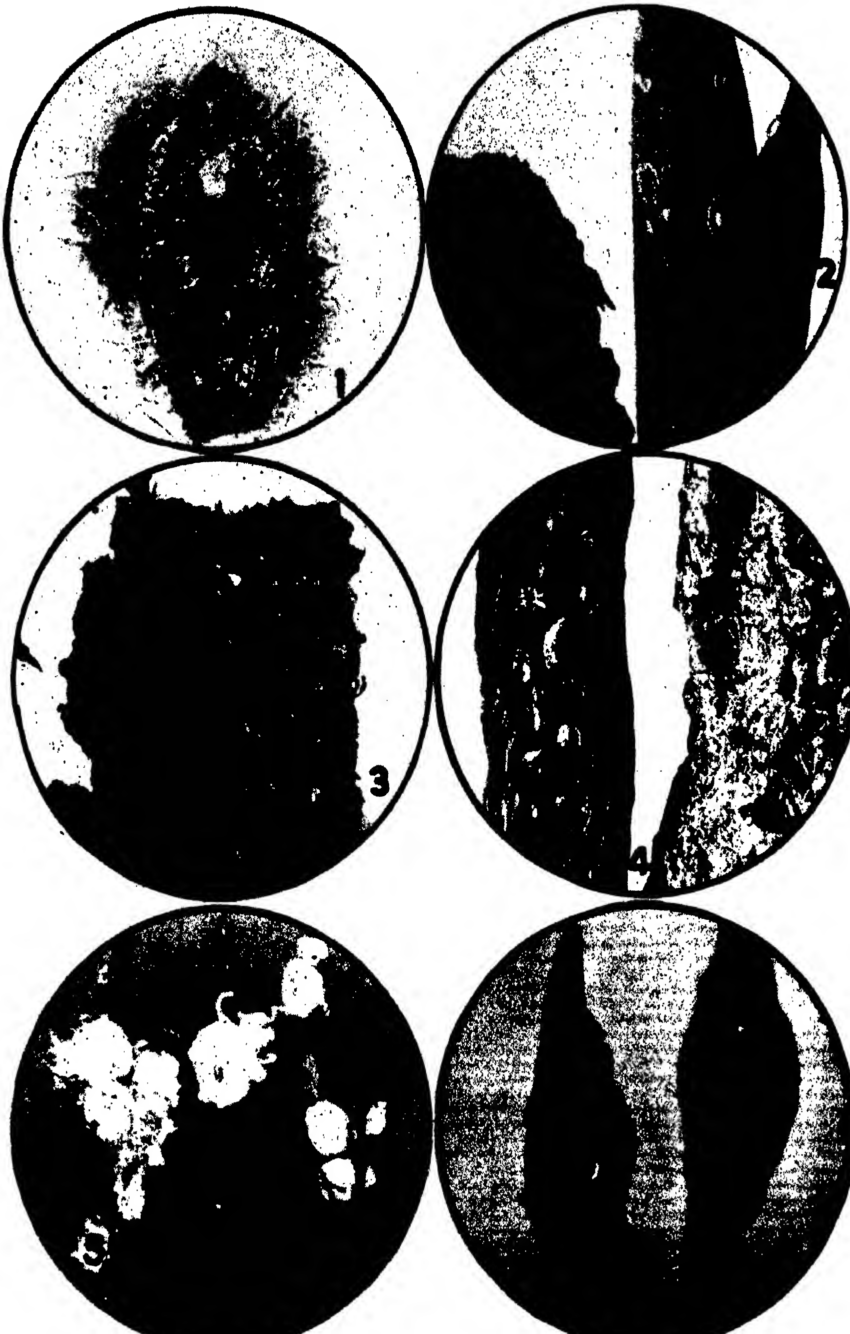

MASKELL SPECIES OF ASTEROLECANIINAE

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PLATE 27

FIGURE 1. *Asterolecanium epacridis* (Maskell). Test of adult female on leaf.

2. *Asterolecanium stypheliae* (Maskell). Tests of adult females on leaves.

3. *Asterolecanium transversum*, new species. Tests of adult females on bark.

4. *Asterolecanium ventruosum* (Maskell). Tests and scars of adult females on bark.

5. *Callococcus acaciae* (Maskell). Adult females with secretion on twigs.

6. *Callococcus leptospermi* (Maskell). Twig galls formed by adult females.

PLATE 28

FIGURE 1. *Cerococcus bryoides* (Maskell). Test of adult female on bark.

2. *Cerococcus indicus* (Maskell). Crowded tests of adult females on twig.

3. *Cerococcus paradoxus* (Maskell). Tests of adult females (probably imperfect).

4. *Cerococcus stellatus* (Maskell). Tests of adult females on bark.

5. *Frenchia semiocculta* (Maskell). Male galls protruding from twig.

6. *Lecaniodiaspis acaciae* (Maskell). Tests of adult females on twigs.

MASKELL SPECIES OF ASTEROLECANIINAE

FOR EXPLANATION OF PLATE SEE PAGE 64

MASKELL SPECIES OF ASTEROLECANIINAE

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PLATE 29

FIGURE 1. *Lecaniodiaspis atherospermae* (Maskell). Tests of males and adult females on bark.

2. *Lecaniodiaspis eucalypti* (Maskell). Tests of adult females on twig.

3. *Lecaniodiaspis mimosae* (Maskell). Tests of adult females on bark.

4. *Lecaniodiaspis mimosae* (Maskell). Same as fig. 3 somewhat enlarged.

5. *Lecaniodiaspis prosopidis* (Maskell). Tests of adult females on bark.

6. *Solenococcus corokiae* (Maskell). Test of adult female on twig.

INDEX

[All the generic and specific coccid names mentioned in the paper are included in this index. Synonyms are given in italics. Bold face numerals indicate the most important reference to each name]

THE GEOLOGY, PETROGRAPHY, AND MINERALOGY OF THE VICINITY OF ITALIAN MOUNTAIN, GUNNISON COUNTY, COLORADO

By Whitman Cross

Of the United States Geological Survey

and

Earl V. Shannon

Of the United States National Museum

INTRODUCTION

By Whitman Cross

The minerals described by Mr. Shannon in the second part of this paper were collected in 1885 and 1887 during the geological survey of the Crested Butte quadrangle, which is on the southern slope of the Elk Mountains in central Colorado. I was at that time assistant to the late S. F. Emmons, specially charged with examination of the igneous rocks, while the stratigraphic and structural geology was the particular field of my colleague, the late George H. Eldridge.

These minerals occur mainly in much altered sediments adjacent to certain large intrusive masses. It was recognized that the occurrence was of unusual interest and deserved much more extended examination than could be given to it at the time of discovery. It was hoped that opportunity might be found at some later date to return to the area for a more thorough study of the minerals and the problem of their origin. But the exigencies of other work have not permitted the carrying out of this plan.

In the Anthracite-Crested Butte folio of the United States Geological Survey, issued in 1894, there is brief reference to the occurrence of these minerals, but all details, including the chemical analyses by L. G. Eakins, here given in Mr. Shannon's description, were left for some later publication.

GEOLOGY OF THE MINERAL DISTRICT

Figure 1 presents the principal geographical and geological features of the area from which most of the minerals to be described were obtained. It represents the geology as shown on the areal sheet of the Anthracite-Crested Butte folio except that the several Paleozoic formations are combined in one unit. Cement Creek and Brush Creek are tributaries of Slate River, which enters the Gunnison near Gunnison City. Taylor River is the principal northern branch of the Gunnison, and the basin under the Sawtooth Range is its extreme head.

The Archean gneisses and schists of the northeastern corner of the figured district are on the western border of a large area, the dominant feature of which is the Sawatch Range, whose crest is some 10 miles to the eastward.

Upturned against the pre-Cambrian mass is a series of five Paleozoic formations. These are, in order of succession: 1, Sawatch quartzite (Cambrian); 2, Yule limestone (Silurian); 3, Leadville limestone (Carboniferous); 4, Weber formation (Carboniferous); and 5, the Maroon conglomerate (Carboniferous). The four lower formations are relatively thin, none exceeding 500 feet in thickness, except locally. In contrast the Maroon conglomerate attains a maximum thickness of about 2,500 feet, but only its lower part is present in the area of the figure. A remnant of Jurassic and Cretaceous (Dakota) beds is represented as dipping northeasterly into the mass of Hunters Hill. This was interpreted by Eldridge as due to deposition against a bluff of Carboniferous sediments, but in view of the complex structure referred to later an overthrust fault seems a more probable explanation.

The sedimentary rocks of the area of Figure 1 are penetrated by three large intrusive bodies, one notable dike and several minor ones, which are no doubt but arms of the large masses. The principal body extends westward for 10 miles, and then turns north for several miles into the heart of the Elk Mountains. A similar branch runs north from the Sawtooth Range. This is the southeastern extremity of the mass, originally mapped by the Hayden survey, the relations of which to the great fault-fold of the Elk Mountains have long excited the interest of geologists. The other two main intrusives occur in contact in the Italian Peak group. They may all be connected at some depth.

In the Anthracite-Crested Butte folio I called the mass in South Italian Mountain granite and the other two bodies diorite. Unhappily, both names fail to indicate the characteristic association of plagioclase and orthoclase; each present in important amount in both rocks. They belong to the group intermediate as regards the

dominant feldspathic constituent between granite and quartz diorite for which I have long used the term quartz monzonite. The "granite" of South Italian Mountain probably has nearly as much plagioclase as the "diorite," though orthoclase is the more conspicuous in the former rock.

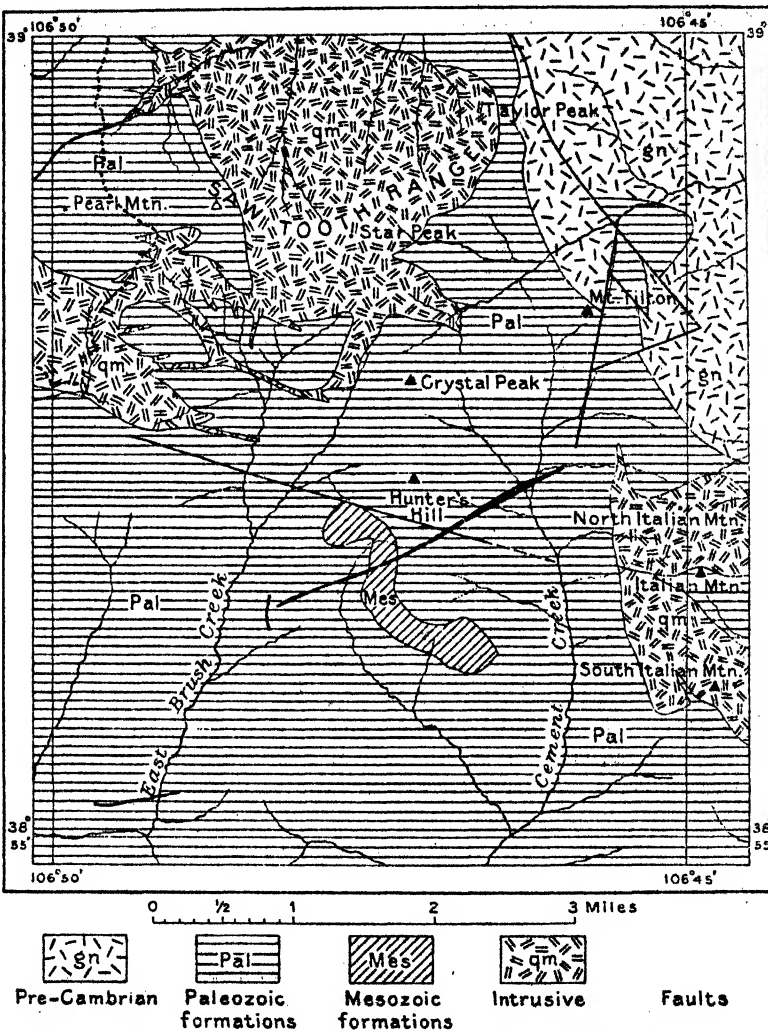


FIG. 1.—GEOLOGIC MAP OF VICINITY OF ITALIAN MOUNTAIN

The Paleozoic bed lying between the intrusive masses and the pre-Cambrian complex are not only highly metamorphosed but are folded and faulted in most intricate manners. On the folio structure section sheet of the Crested Butte quadrangle Mr. Eldridge has indicated by symbols a great variety of dips, both anticlinal and syn-

clinal axes and others of complex folding. But he could not work out all details of structure in the time at his disposal.

It is natural to inquire how nearly contemporaneous the periods of faulting and folding, intrusion and metamorphism, may have been. The zone of intense folding along an axis approximately parallel to the basal contact zone crossing Mount Tilton extends north and south from Italian Peak for 10 miles or more in each direction, far beyond the limit of metamorphism and intrusion, and it appears certain that the major structural feature is independent of and earlier than the intrusive action while the metamorphism is clearly associated with the latter. It seems inconceivable, however, that the large intrusions can have occurred in such folded and fractured rocks without adding materially to the structural complexity.

It appears that the Elk Mountains fold is one element in the system of orogenic movements which occurred at the close of the Cretaceous and continued into the Eocene. The intrusions of Italian Mountain and the Sawtooth Range are considered as belonging with the large number of stock, dike, and laccolith intrusions of similar petrographic character occurring over a wide area in Colorado and adjacent parts of Utah and Arizona. There is, however, no evidence thus far noted to suggest that they are much younger than the structural features.

The great San Juan mountain area of volcanic and intrusive rocks lies south of the Gunnison Valley. Its lower volcanics extend down to the Gunnison Canyon in some places and there meet similar if not identical materials belonging to the West Elk Mountains breccia, which forms an important mass extending as far north as the Anthracite quadrangle. Thus it appears that the igneous history of the Elk Mountains should be considered as but one local phase of the great volcanic activity in southwestern Colorado, which in the San Juan region continued at intervals through all Tertiary time.

PETROGRAPHIC CHARACTER OF THE INTRUSIVES

The petrographic character of the intrusive rocks in the area of Figure 1 is simple and, in general, similar to that characterizing many other occurrences in Colorado. The largest body has a nearly uniform composition and texture wherever it has been examined in the Crested Butte quadrangle for 10 miles west of Star Peak. It is of varying shades of gray in color, evenly fine-grained, most mineral particles ranging between 0.5 and 2 mm. in diameter. Plagioclase, orthoclase, quartz, biotite, hornblende, with occasional green augite, are the principal minerals. The lighter colored minerals predomi-

nate. Biotite and hornblende occur rather in grains than in leaves or prisms and their even distribution is a marked feature. Magnetite, apatite, titanite, zircon, pyrite, and allanite are the accessories in decreasing order of abundance. Honey-yellow titanite grains or crystals are characteristic but allanite is very rare.

Plagioclase is the most abundant constituent, occurring in stout little prisms often with an irregular fringe of oriented orthoclase. Zonal variation is usual, the center being Ab_3 An_4 is some crystals determined and the outer zones ranging to oligoclase. Orthoclase and quartz play similar rôles, each occuring commonly in anhedral grains but not infrequently serving as matrix for other mineral particles in irregular patches of microscopic size.

Biotite and hornblende, of usual characters, are nearly always fresh, chlorite and epidote being the more frequent alteration products.

In the following table is given a chemical analysis of this rock by L. G. Eakins, together with others of nearly allied intrusives of other localities. The corresponding norms are shown in another table. Both analyses and norms have been taken from Washington's Tables.[1] All analyses were made in the laboratory of the United States Geological Survey.

Table of analyses

	I	II	III	IV	V	VI	VII	VIII
SiO_2	62.71	62.85	61.42	63.91	64.85	62.10	58.74	63.39
Al_2O_3	17.06	16.21	17.69	17.07	16.57	15.47	16.02	16.58
Fe_2O_3	3.79	3.08	4.24	4.39	2.10	2.64	4.16	1.41
FeO	2.74	1.46	1.74	1.51	2.15	3.15	3.50	3.08
MgO	1.78	1.47	1.61	.81	2.14	2.57	2.18	2.15
CaO	5.51	4.72	5.29	4.47	4.01	5.31	5.12	4.76
Na_2O	3.54	3.49	3.14	3.48	3.71	3.56	3.26	3.47
K_2O	2.96	3.10	3.19	3.74	3.10	3.15	2.39	2.79
H_2O+	.24	2.03	.97	.33	.35	.72	1.60	1.87
H_2O-		.29				.14	.83	.22
TiO_2		.41	.37		.91	.81	1.29	.44
P_2O_5		.48	.14	.21	.14	.27	.56	.14
MnO	Trace.	.15	.19				.22	
BaO		.11	.09				.10	.11
FeS_2							.11	
ZrO_2							.05	
	100.33	99.85	100.28	99.92	100.03	99.89	100.13	100.41
Analyst	Eakins.	Chatard.	Eakins.	Eakins.	Whitfield.	Steiger.	Hillebrand.	Stokes.

[1] Washington, H. S., Chemical Analyses of Igneous Rocks, U. S. Geol. Survey Prof. Paper 99, 1917.

Table of norms

	I	II	III	IV	V	VI	VII	VIII
Q	16.44	19.98	17.64	19.74	19.50	15.48	17.04	18.06
Or	17.79	18.35	18.90	21.68	18.35	18.90	14.46	16.68
Ab	29.87	29.34	26.20	29.34	31.44	29.87	27.77	29.34
An	22.24	19.46	24.74	20.29	19.18	16.96	21.68	21.13
di	4.02	.86	.65	...	...	6.02	...	1.33
hy	4.44	3.30	4.20	2.00	16.19	5.88	6.82	8.43
mt	5.57	3.94	5.34	4.87	3.02	3.71	6.03	2.09
il	...	.76	.76	...	1.67	1.52	2.43	.91
hm	...	.32	.64	1.12	...	...	...	...
ap	...	1.01	.34	.67	.34	.67	1.34	.34
	(1)II.4.3(3)4 Tonalose.	I(II)4.3(3)4 Yellowstonose.	I(II)4.33" Amiatose.	1".4".3.3" Amiatose.	I(II)4".3(3)4 Yellowstonose.	"II.4.3".4 Tonalose.	"II.4.3".4 Tonalose.	(1)II.4.3.(3)4 Tonalose.

I. Quartz monzonite. West Brush Creek, Crested Butte quadrangle, Colo. Nearly identical with the mass in the Sawtooth Range. Washington's Tables, p. 374.

II. Quartz monzonite. From a large asymmetrical laccolith, Mount Marcellina, Anthracite quadrangle, Colo. Washington's Tables, p. 254.

III. Quartz monzonite porphyry. Storm Ridge. Anthracite quadrangle, Colo. Washington's Tables, p. 246.

IV. Quartz monzonite. Sultan Mountain, near Silverton, San Juan region, Colo. Washington's Tables, p. 246.

V. Quartz monzonite. Electric Peak, Yellowstone National Park. Washington's Tables, p. 254.

VI. Quartz monzonite. Frisco district, Utah. Washington's Tables, p. 374.

VII. Quartz monzonite, near Pinal Peak, Globe district, Arizona. Washington's Tables, p. 376.

VIII. Quartz monzonite porphyry. Grass Valley, Nevada County, Calif. Washington's Tables, p. 382.

The intrusive mass which extends from North Italian Mountain to the summit of Italian Peak proper is very much like the fine-grained quartz monzonite of which a description and analysis have been given. It is, however, more variable in texture and composition than the larger body. The common facies is a quartz-biotite-hornblende rock, but augite appears in some places, and near the contacts hornblende is apt to be more abundant than elsewhere. A crude prophyritic texture appears here and there, though a development of orthoclase in a few phenocrysts 1 to 2 cm. in diameter and locally plagioclase and hornblende are conspicuous.

The rock of South Italian Mountain differs but little in any essential respect from that of the northern summit. It is the older intrusive and, due to incipient alteration of the orthoclase by dissemination of ferric hydroxide particles all through most grains, there is a dull pinkish tinge to this feldspar, causing the appearance of more potash feldspar than is actually present. The same impregnation is also exhibited to a lesser extent in the plagioclase. Reexamination of this rock makes it probable that the plagioclase (oligoclase-andesine) is probably as abundant as orthoclase, if not more so, and the name quartz-monzonite applies to that rock of both intrusives.

As shown by the Hayden map, the intrusive of South Italian Mountain extends about 3 miles to the southeast, forming a nearly straight ridge. The great amount of talus and slide rock about both intrusives effectually conceals contacts with the sedimentary beds except in a few localities. At observed contact exposures the intrusive was obviously crosscutting.

The long dike crossing Hunters Hill is presumably an offshoot from the conduit of the North Italian Mountain body, for its central portion is very similar to the hornblendic contact zone facies of the large mass. At its maximum width of 250 feet in Cement Creek Valley there are dark lamprophyric contact zones 20 feet or more wide on either side of this dike, bu they are inconspicuous in narrower portions.

OCCURRENCE OF THE MINERALS

The minerals to be described by Mr. Shannon occur very abundantly in a contact zone, of very variable width from place to place, about the quartz monzonite intrusive masses above considered. Most of them also occur in crystalline coatings on the walls of narrow fissures in the intrusive rocks or perhaps filling such cracks completely.

The most highly altered sediments, in which the minerals are most perfectly and freely developed, are in the wedge-shaped area caught between the two intrusive masses of the Italian Mountain group. At and about the summit of the central peak where several small dike offshoots penetrate the sediments the secondary minerals are abundant and the original character of the strata entirely obliterated. The yellowish-green fluoriferous epidote and chlorine-bearing mizzonite, of which Mr. Shannon quotes analyses by Eakins, were found on the central peak of the group.

Another exceptionally fine spot for collecting the minerals is near the summit of North Italian Mountain on the west and north. It was here that a carbonaceous shale of the Weber formation was changed to a graphitic mass with garnet crystals, black from included particles.

The extensive alteration of strata about the larger and very irregular intrusive body results in the formation of secondary minerals of good crystal habit in many places but far less commonly than in Italian Mountain. But the presence of garnet, epidote, and pyroxene in crystals attracting attention was noted in many places a mile or more from the surface contact of the intrusive body. For most of the contact zone in the Crested Butte quadrangle the Maroon conglomerate is the formation adjacent to the igneous rock. The striking red color of the beds, normal where they are distant from intrusive masses, gives way in the contact zone to somber purple or mottled

red and green and other tones. Induration by hornfels formation causes the sediments to resist erosion almost as much as does the quartz monzonite, and where the former have been somewhat bleached it is often no easy matter to detect the actual contact except by close examination. Teocalli Mountain (13,220 feet) exhibits a striking example of the change in color of beds in the contact zone.

One commonly observable feature of the alteration of the limestone pebbles which are abundant in the Maroon conglomerate is the change of the mass of the pebble into white granular marble, while the impurities have been concentrated in one or at least only a few good-sized crystals of garnet.

In some parts of the great intrusive body of quartz monzonite there are many huge xenoliths of sedimentary beds torn loose from the irregular walls. Some 16 of these were large enough to indicate on the Crested Butte map. Such bodies are naturally very greatly altered, much like the contact zone rocks. Few of them were accessible for close examination.

The quartz monzonite intrusives have suffered very little from alteration of any kind. But they were considerably and irregularly fissured at an early date, and in these fissures, seldom more than an inch or two in diameter, there was deposited a more or less complete filling of one or more of the secondary minerals characteristic of the contact zone. In some places an aplitic or pegmatitic filling is complete. Mr. Shannon has examined the specimens collected and finds the species described in the following pages generally occurring in the wall linings where cracks have been but partially filled.

In conclusion, there are several special points of interest attaching to this district of contact zone mineralization which may be summarized. The minerals are mainly silicates such as are commonly produced in contact zones where a sedimentary section of various rocks, largely carbonates, is penetrated by extensive igneous bodies. The reactions resulting in the new compounds arise from the permeation of the sediments under a condition of high heat, long sustained, by hot aqueous solutions carrying absorbed gases and other "mineralizing agents."

The particular interest of this occurrence lies partly in the unusual perfection of development of some species, as vesuvianite, garnets, pyroxenes, and amphiboles. The specimens obtained were secured in a short time in the course of geological field work. It is evident that when carefully explored as a mineral locality a much more extensive collection and doubtless of finer quality can be made.

Another feature of note is that while the intrusive masses are very similar petrographically to many others known in the adjacent country to the south or west there is no corresponding contact zone

alteration of the sediments in any other locality. The presence of chlorine and fluorine in mizzonite and epidote, respectively, on Italian Peak shows that unusual mineralizers accompanied the quartz monzonite magma in that particular intrusion, but it seems unwarranted to assume that any large part of the extensive mineral formation was due to the activity of these agents.

The greatly folded and faulted or crushed condition of the sediments in the mineralized area has been emphasized. It seems probable that the high permeability of the intruded rock complex by solutions or gases was the most important factor in the case.

DESCRIPTION OF THE MINERALS

By Earl V. Shannon

In the collection of some 200 specimens from the Italian Mountain locality 28 minerals were observed. These are described in some detail in the following pages in the order listed below.

1. Garnet.	11. Chlorites.	21. Hematite.
2. Diopside.	12. Mizzonite.	22. Chalcedony.
3. Sahlite.	13. Quartz.	23. Siderite.
4. Vesuvianite.	14. Scolecite.	24. Ankerite.
5. Epidote.	15. Thomsonite.	25. Calcite.
6. Albite.	16. Stilbite.	26. Pyrite.
7. Anorthite.	17. Heulandite.	27. Apatite.
8. Orthoclase.	18. Chabazite.	28. Barite.
9. Titanite.	19. Graphite.	
10. Talc.	20. Magnetite.	

GARNET

Garnet is the most abundant mineral in the collection and occurs in a variety of forms, habits, and colors, and exhibits considerable variation in composition and associations.

The most abundant garnet is pale buff in color, varying to almost colorless in some specimens. This forms more or less well-developed crystals varying from 1 mm. to nearly 4 cm. in diameter. The average color is light buff but varies from practically colorless through various shades of light brown to greenish buff or green. This garnet occurs lining open spaces in massive garnet or garnet-diopside hornfels as loosely assembled aggregates of large garnets or as druses along the open centers of seams. Some of the crystals are transparent, most of them from translucent to opaque in the specimen. The smaller crystals are the most perfectly developed. All

of them have the same habit, the dodecahedron *d*(110) modified by narrow faces of the hexoctadedron *s*(321). Rarely the dodecahedron alone is present, and in a few specimens the hexoctahedron forms the dominant faces, reducing the faces of the dodecahedron to minute size.

Minerals associated with this garnet in the 30 crystallized specimens included in the collection include diopside, vesuvianite, epidote, pyrite, and the zeolites, chabazite, stilbite, heulandite, and scolecite. While the diopside is probably contemporaneous with the garnet in part, all the others rest upon the garnet crystals or occupy the interstices between them and seem later.

This buff garnet was analyzed by Eakins, but the exact specimen used for the analysis is not indicated, 24 having the same number. The analysis is given below.

Analysis of buff garnet

[L. G. Eakins, analyst]

Constituent	Per cent	Ratios		
SiO_2	39.26	0.655	0.655	1.00 × 3
Al_2O_3	19.63	.192	.220	1.01 × 1
Fe_2O_3	4.48	.028		
MnO	Trace.			
CaO	36.61	.653	.653	.00 × 3
MgO	Trace.			
H_2O	.08			
Total	100.06			

The ratios obtained from this analysis indicate very exactly the garnet formula, $3R''O.\ R'''_2O_3.\ 3SiO_2$, and the absence of ferrous iron, magnesia, and manganese indicate that it is a simple two-component isomorphous mixture of the lime-alumina garnet grossularite, $Ca_3Al_2Si_3O_{12}$, and the lime-ferric iron garnet andradite, $Ca_3Fe'''_2Si_3O_{12}$. The above garnet analysis indicates these two compounds to be present in the proportions of 86 per cent of grossularite to 14 per cent of andradite. The specific gravity of the analyzed sample was determined by Eakins to be 3.629 at 23° C. The calculated specific gravity for a garnet of this composition from Ford's data for the end members is 3.561, the difference 0.068 probably indicating an error in the determination.

Unfortunately, the refractive index of the analyzed sample was not determined. The calculated refractive index for the above com-

position is 1.747. Several specimens from the same lot were examined optically. One specimen of small transparent very pale brownish crystals overlain by chabazite and a little scolecite was found to be colorless and transparent and completely isotropic with a homogeneous index of 1.745. Another of transparent pale amber crystals was 1.752. Nearly colorless crystals 5 mm. in diameter had an index of 1.746. An aggregate of fairly large crystals of a brown color, translucent in the hand specimen, showed distinct birefringence, and, although the index of the bulk of the material was about 1.75, the crystals are evidently zoned and vary in index from 1.752 to about 1.780. Another specimen showing very large crystals—up to 4 cm. in diameter—appears slightly zoned in color in the hand specimen and ranges in index from 1.753 to 1.756. Most of the nearly transparent crystals seem to approximate closely the calculated refractive index.

This brown grossularite occurs not only as the crystals described above but also makes up large masses of dense garnet rock, sometimes almost pure but usually containing considerable amounts of diopside, even when no green color due to the diopside can be detected. Such garnet-diopside hornfels forms the matrix of the crystallized grossularite specimens and also of the numerous specimens which bear vesuvianite in the cavities. One dense lustreless hornfels of pale brown color, the cavities of which were lined with nearly colorless grossularite, was found to consist of approximately equal parts of fine-grained colorless diopside and colorless isotropic garnet with an index of refraction of 1.745 (No. 84553). The matrix of one of the best specimens of vesuvianite (No. 84548), a typical hornfels of this lot of specimens, likewise shows a large proportion of colorless isotropic garnet the index of which ranges from 1.745 to 1.748.

A second lot of garnet decidedly different from the last (No. 84556) is labeled as from North Italian Mountain and contains 10 specimens. This consists of brilliant sulphur-yellow to greenish sulphur-yellow crystals of perfect dodecahedral form averaging only about 3 mm. in diameter. These little garnet crystals appear disseminated through coarse granular calcite, sometimes sparsely and sometimes so thickly as to make up solid masses of granular garnet rock. Usually the garnet is alone, but in a few specimens it is accompanied by vesuvianite in perfect little embedded crystals of a brown color. This garnet was also analyzed by Eakins, the results being given, with ratios, below.

Analysis of yellow garnet

[L. G. Eakins, analyst]

	Per cent	Ratios		
SiO_2	37. 89	0.631	0.631	1.02 × 3
Al_2O_3	7. 90	.077	.180	.87 × 1
Fe_2O_3	16. 43	.103		
CaO	35. 43	.632	.632	1.02 × 3
MgO	. 59			
Na_2O	1. 10			
H_2O	. 36			
Total	99. 70			

The ratios of this analysis do not approach so nearly to the ideal garnet proportions, the high bases and silica as well as the presence of magnesia and soda suggesting contamination of the sample by some foreign constituent which seems surprising, as the material of the specimens appears ideal. This also is essentially a simple member of the andradite-grossularite series, but here andradite makes up a greater proportion, the analysis indicating approximately 60 per cent of andradite to 40 per cent of grossularite. The specific gravity of a garnet of this composition should be 3.662, while the specific gravity of the analyzed sample is recorded as 3.72 at 16° C. The refractive index should be 1.831. It was found to be well above 1.80, the highest immersion oil at hand.

One other garnet analysis made on material from this locality is recorded by Eakins. This gives the following results:

Analysis of garnet

[L. G. Eakins, analyst]

	Per cent	Ratios		
SiO_2	36. 88	0.615	0.615	1.01 × 3
Al_2O_3	10. 34	.101	.210	1.02 × 1
Fe_2O_3	17. 51	.109		
CaO	34. 85	.623	.623	1.00 × 3
MgO	. 43			
Na_2O	Trace.			
H_2O	. 21			
Total	100. 22			

This appears to be a much better garnet analysis than the last, but there is nothing to indicate the type of material or the specimen on which it was made. It evidently is also a member of the andradite-grossularite series, containing 55 per cent andradiate and 45 per cent

grossularite. Such a garnet has a calculated gravity of 3.651, while the measured specific gravity is given as 3.721 at 17.2° C.

A third lot of garnet (No. 84550) from the north side of the gulch leading north of North Italian Mountain contains four specimens. The garnet is in brown, more or less globular masses, ranging from 1 to 6 mm. in diameter. These are scattered sparsely through dirty white granular marble and are conspicuous on weathered surfaces. When closely examined the globules are found to be made up of innumerable very minute dodecahedral units in parallel position. The powder of these garnets is pale brown, and under the microscope they exhibit a peculiarly wavy appearance and comparatively strong birefringence. They are probably andradite, since the refractive index is much higher than 1.80.

Distinctly green garnets were seen in several specimens. Beautifully sharp little green dodecahedral garnets 2 mm. in diameter, lining a cavity of garnetiferous hornfels of one specimen (No. 84551) from Italian Mountain, have a beautifully iridescent metallic sheen or luster. A few stilbites were deposited on them, followed by a layer of chabazite, and then the cavity was filled with calcite. They are now exposed where the calcite has dissolved away. Another specimen (No. 84576) has a druse of 1 to 2 mm. green dodecahedral garnets crusting garnet hornfels and overlain by little crystals of adularia and pyrite.

One specimen (No. 84551) consists of small opaque-appearing sharp dodecahedral brown garnet crystals up to 2 mm. in diameter, thickly scattered in white calcite and making up a granular rock.

Two specimens show garnet crystals which display an unusually sharp color zoning (No. 84558). These occur in veins up to 2 cm. wide in fine-grained green diopside rock. The garnet crystals overlie diopside prisms and are themselves overlain by epidote and calcite. The garnet crystals are dodecahedrons narrowly truncated by the trapezohedron and reach 1 cm. in diameter. The cores of the garnets are deep red-like almandite with an outer border about 1 mm. thick of pale buff material and a very thin outside brown shell. The indices of all parts of the crystals are well above 1.80, so that the material is doubtless andradite with varying amounts of the grossularite molecule.

A specimen of highly graphitic schist from North Italian Mountain (No. 84552) contains numerous black dodecahedral garnets averaging 5 mm. in diameter. When powdered this garnet is black and white, and under the microscope it is seen to owe its black color to black opaque inclusions, doubtless of graphite. The garnet itself is colorless in section and isotropic with an index of refraction of 1.742 to 1.744.

Another single specimen (No. 84549) is labeled "garnet on limonite" and consists of a heavy iron-stained mass mainly made up of blackish garnets of dodecahedral form narrowly truncated by the octahedron. Under the microscope the garnet is colorless, but contains opaque brownish material. Its index is, for the most part, 1.736, but varies to 1.745. It is probably grossularite.

DIOPSIDE

Diopside is a common mineral and occurs in many specimens, in some as almost ideally perfect twinned prisms, in others as both small twinned prisms and simple crystals of small size but perfect form. Moreover, this mineral occurs in massive form, making up a solid green diopside rock, and also mixed with more or less garnet in a hornfels which is the base of most of the fine specimens of vesuvianite and grossularite.

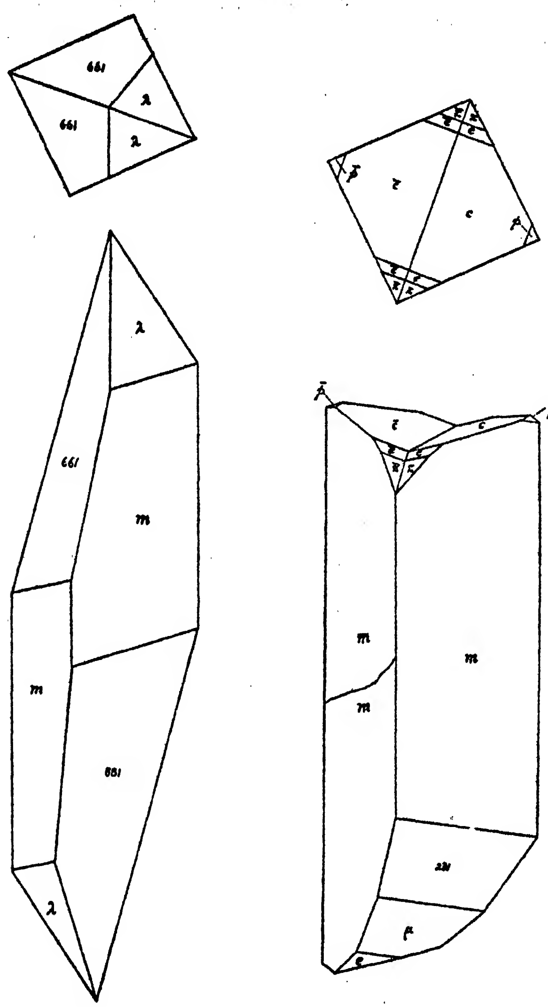
Most noteworthy are the twinned diopside crystals which attain a size of 8 by 10 mm. or more. These are gray-green or olive gray-green in color and rest upon the walls of cavities in massive diopside rock. Practically all of the crystals are contact twins on (100) and the larger ones are rather highly modified. The interstices between the diopside crystals may contain later epidote, andradite garnet, or calcite. A crystal typical of the best and larger twins is shown in Figure 4. This gave the following measurements:

Measurements of diopside, Figure 4

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*c*	0	001	Medium	89 14	15 38	90 00	15 51
2	*a*	∞0	100	Poor, narrow	89 14	90 00	90 00	90 00
3	*b*	0∞	010	Excellent	0 00	90 00	0 00	90 00
4	*e*	01	011	do	25 39	33 24	25 43	33 00
5	*p*	−10	$\bar{1}01$	do	90 00	15 55	90 00	15 27
6	*m*	∞	110	do	43 35	90 00	43 33	90 00
7	*ε*	+12	121	Good	35 18	55 00	35 36	55 24
8	*μ*	−12	$\bar{1}21$	Excellent	13 25	50 36	$\bar{1}3$ 12	50 27

This figure is drawn with the position of the clinopinacoid, *b* (010) in front. When one of these larger twinned crystals is crushed and examined under the microscope as a powder of 80 mesh or under it is found to be pure and practically colorless. The indices are subject to a slight variation from grain to grain but the material is fairly homogeneous. The optical properties, mean, as measured are: Biaxial negative with 2V medium, dispersion, $r < v$, pronounced. The average indices of refraction are, $\alpha=1.676$, $\beta=1.683$, $\gamma=1.702$. The extinction, Z ∧ *c*, is 36° average of a number of measurements on

grains which are possibly cleavage fragments lying on a face of the (110) cleavage. The maximum extinction measured on such a grain was 43° and the minimum 30°. Scattered grains show, in addition to the contact twinning on 100 which is not observed in crushed fragments, the insertion of thinner lamellæ in twinned position.



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FIGS. 2–3.—2, DIOPSIDE CRYSTAL OF STEEP PYRAMIDAL HABIT. PROJECTED ON (010). 3, DIOPSIDE CRYSTAL TWINNED ON (100). PROJECTED ON (010)

Grains showing this twinning were found to be parallel to the optic axial plane or perpendicular to the optic normal, and since they give symmetric extinction of approximately 22° on either side of the twinning plane it is probable that the twinning is on the basal pinacoid *c* (001).

The matrix of these larger gray-green twinned pyroxenes is in all cases a pale gray-green rock of fine sugary texture which consists of almost pure diopside. Examined under the microscope this diopside is found to be essentially the same in optical properties and hence probably in composition, as the foregoing crystals.

An analysis of diopside from this locality made by Eakins doubtless represents the larger twinned crystals. This gave the following results:

Analysis of diopside crystals

[L. G. Eakins, analyst]

Constituent	Per cent	Ratios	
SiO_2	47.53	0.791	0.791
Al_2O_3	9.88	.097	.108
Fe_2O_3	1.79	.011	
FeO	.91	.013	.829
MgO	14.43	.361	
CaO	25.46	.455	
Na_2O	trace		
H_2O	.30		
Total	100.30		

The specific gravity of the analyzed material is given as 3.312 at 16.7°. It is stated that the diopside is associated with vesuvianite, scapolite, garnet, epidote, etc., which probably means the collection as a whole rather than the individual specimen from which the material for analysis came, since all of these minerals were in no case found in a single specimen studied by the writer.

If this analysis be recast into constituent molecules according to the method of Washington and Merwin the following table is obtained:

Diopside ($CaMgSi_2O_6$)	83.75
Hedenbergite ($CaFeSi_2O_6$)	3.23
Wollastonite ($CaSiO_3$)	3.62
$Fe_2O_3+Al_2O_3$	11.67
	102.27
Deficiency in SiO_2	2.27
Sum	100.00

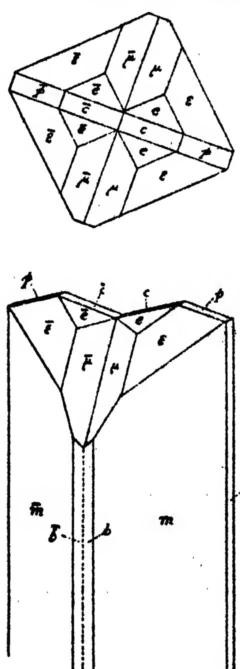
Another and but slightly different type of diopside is found in certain greenish-gray masses of massive pyroxene of very porous texture, the cavities of which are occupied by small crystals, some of them, like the last, twinned on (100) and others simple, of an acute pyramidal habit. The crystals reach a length of only 3 or 4 mm. Some of the twins show terminal faces of several forms and others are very simply truncated by only *c* (001). One twinned crystal from a specimen of this kind is illustrated in Figure 3. This is the only doubly terminated crystal seen in this specimen, and the

lower end is not twinned and, as shown in the drawing, has a distinctly different habit from the twinned end. The angles measured in two settings of both ends of this crystal are given in the following table:

Angles of diopside crystal, Figure 3

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		ϕ	ρ	ϕ	ρ
					° ′	° ′	° ′	° ′
1	c	0	001	Medium	89 14	16 17	90 00	15 51
2	m_2	∞	110	Good	43 35	90 00	43 33	90 00
3	e	01	011	Medium	25 30	33 48	25 43	33 11
4	z	02	021	Excellent	13 15	51 06	13 32	50 29
5	p	−10	$\bar{1}01$	Good	89 49	15 59	90 00	15 27
6	μ	12	121	do	35 47	55 27	35 36	55 24
7	s	23	231	do	38 30	66 16	n. c.	n. c.

Many of the crystals of specimens of this type are simple in habit and, in a few measured, these are very poor in forms. A typical



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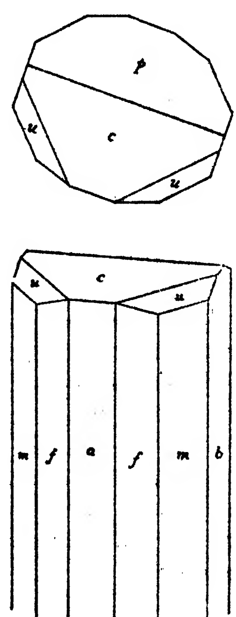

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FIGS. 4–5.—4, DIOPSIDE CRYSTAL. TWINNED ON (100). 5, SAHLITE CRYSTAL

one showing as a prominent form a new positive pyramid (661) is shown in the drawing, Figure 2. This crystal gave the angles as illustrated above.

Angles of diopside crystal, Figure 8

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*b*	0∞	010	Poor	1 22	90 00	0 00	90 00
2	*m*	∞	110	Medium	44 06	90 00	43 33	90 00
3	new	*6	661	Good	46 36	79 10	N. C.	N. C.
4	λ	−3	$\bar{3}$31	Excellent	37 52	66 47	38 19	66 04

Although no optical properties were measured or no analyses made upon material of the last-described specimens, they are probably very similar in composition to the foregoing.

SAHLITE

While most of the pyroxene of this locality consist of nearly pure diopside, there are several specimens which are largely made up of another member of the diopside-hedenbergite series shown by its optical properties to be somewhere near midway between these two end members.

The principal lot of these specimens (No. 84565) contains several large masses almost entirely composed of blackish green pyroxene varying from massive granular material to prismatic crystals of simple habit up to 4 by 10 mm. in size, which project into open spaces or into calcite which fills part of the vugs. In the empty vugs a few scattered whitish apatite crystals rest upon and are evidently later than the sahlite. Optically this pyroxene is biaxial and positive with 2V large, dispersion $r > v$, perceptible. Under the microscope it varies slightly from pale brownish-green to blue-green, the latter probably being the original tint, the brown being due to incipient oxidation. It shows good cleavage. The maximum extinction measured on crushed fragments is 44°. The refractive indices measured are $\beta=1.690$, $\gamma=1.715$. The crystal habit is illustrated in Figure 5. In some cases the crystals are sheathed with an outer coating of actinolite, the fibers of which parallel the vertical axis of the pyroxene crystal. The crystal which was measured gave the following angles:

Measurements of sahlite crystal, Figure 5

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*c*	0	001	Very poor	90 00	17 19	90 00	15 51
2	*a*	∞0	100	Excellent	90 00	90 00	90 00	90 00
3	*m*	∞	110	Very good	43 34	90 00	43 33	90 00
4	*f*	3∞	310	Poor	70 57	90 00	70 41	90 00
5	*u*	+1	111	Very poor	54 12	45 54	55 04	45 50
6	*p*	−10	$\bar{1}01$	do	90 00	16 10	90 00	15 27

Another single specimen (No. 84580) from Taylor Peak has what apparently is altered diorite for a base with euhedral crystals of vitreous blackish-green pyroxene projecting into a mass of stilbite and scolecite. The pyroxene crystals are all broken and show no terminations remaining. The remnants of crystals reach 15 by 40 mm. in size. Under the microscope the crushed pyroxene is fresh, pale blue-green and nonpleochroic. It is biaxial positive with 2V medium large, dispersion r < v weak to marked. The extinction is $Z \wedge c = 41°$ maximum measured on cleavage fragments. The refractive indices measured are: $\alpha = 1.682$, $\beta = 1.697$, $\gamma = 1.713$.

VESUVIANITE

Vesuvianite is one of the most interesting and attractive of the minerals occurring at Italian Mountain and constitutes very excellent mineralogical specimens containing well developed crystals, some of which reach fairly large size. With the possible exception of Crestmore, California, and one or two Maine localities, no place in America has heretofore furnished such fine specimens of this mineral and the specimens from the other localities mentioned are distinctly different in habit, color, and associations.

The most abundant type of vesuvianite represented in the collection occurs in crystals of transparent yellowish olive-green color varying gradually in habit from bipyramidal to short prismatic. These are found either singly or in groups or crusts implanted on the walls of open spaces in a dense garnet-diopside hornfels. The limits of variation in crystal dimensions are illustrated in Figures 6 and 7. Figure 6 exposes the commonest habit—bipyramidal with the dominant form the unit pyramid *p*(111), the prismatic faces being greatly suppressed. A small crystal of this habit gave the following measurements:

Measurement of vesuvianite, Figure 6

Form		Symbol		Quality description	Measured		Calculated	
No	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*a*	0∞	010	Very good	0 00	90 00	0 00	90 00
2	*m*	∞	110	Excellent	45 46	90 00	45 00	90 00
3	*f*	∞2	120	Good	26 37	90 00	26 34	90 00
4	*p*	1	111	Excellent	45 31	37 19	45 00	37 14
5	*c*	0	001	Good	--------	0 00	--------	0 00

The crystals vary gradually through elongation of the prismatic direction to the proportions of Figure 7. Many crystals of such proportions are very simple and the one illustrated is about the most highly modified seen. This, upon measurement on the 2-circle goniometer gave the following angles:

Measurements of vesuvianite, Figure 7

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*c*	0	001	Medium	-- --	0 00	-- --	0 00
2	*a*	0 ∞	010	Fair	0 20	90 00	0 00	90 00
3	*m*	∞	110	-----do	45 24	90 00	45 00	90 00
4	*φ*	$\infty\frac{5}{3}$	350	v. poor	30 53	90 00	30 58	90 00
5	*p*	1	111	Excellent	45 16	37 16	45 00	37 14
6	*o*	01	011	Fair	0 46	27 37	0 00	28 15
7	*t*	3	331	v. good	45 16	66 12	45 00	66 19
8	*s*	13	131	Fair	14 07	57 59	18 36	59 32

Other specimens show crystals, differing from the last chiefly in greater opacity and darker green color, forming solid crusts so that no individual is completely developed. These show some forms not present on the more perfect crystals as illustrated in the drawing, Figure 9. This crystal gave the following angles:

Measurements of vesuvianite, Figure 9

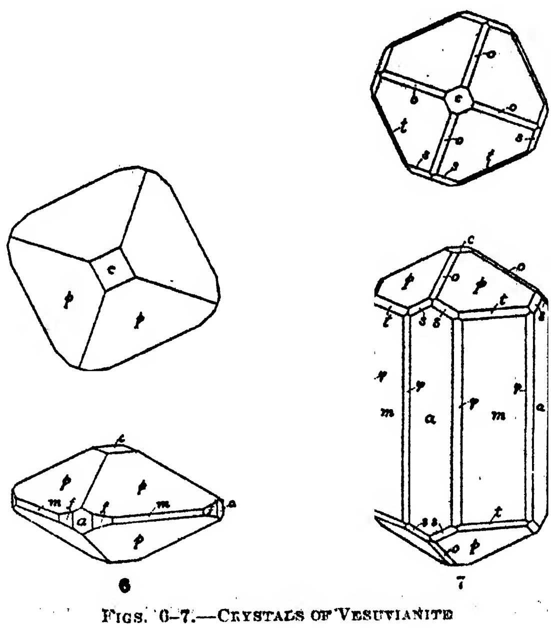
Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*a*	0 ∞	010	Excellent	0 00	90 00	0 00	90 00
2	*h*	∞3	130	v. p. narrow	18 20	90 00	18 26	90 00
3	*o*	01	011	-----do	0 00	27 09	0 00	28 15
4	*u*	02	021	-----do	0 00	46 02	0 00	47 04
5	*π*	03	031	-----do	0 00	58 00	0 00	58 12

The better crystals of vesuvianite are all about alike optically. Under the microscope the mineral exhibits low birefringence and the larger crystals are homogeneous, have uniform extinction and show faint zoning in birefringence in basal sections. Different zones vary very slightly in refractive indices and from uniaxial to biaxial with 2V very small. The average refractive indices are

$$\epsilon=1.713,\ \omega=1.715.$$

The thicker grains show pleochroism with ω=pale yellow-green, ϵ= colorless. No cleavages were noted.

The crystals vary in size from a few which are minute to an observed maximum of 2.5 cm. thick by 5 cm. long. The most frequent and best developed ones are around 1 cm. in size.



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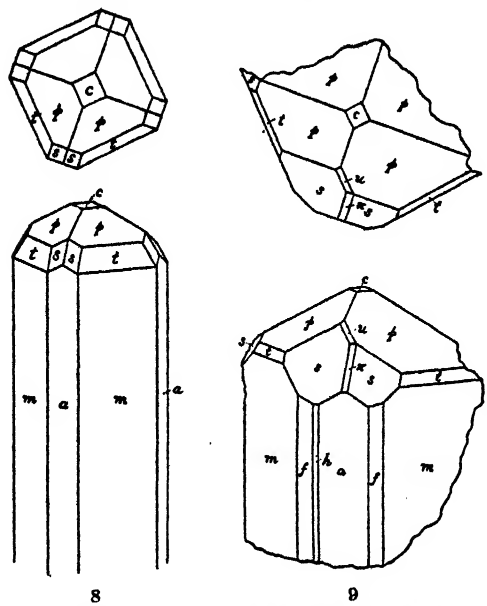
Figs. 6–7.—Crystals of Vesuvianite

Some 60 specimens of this yellow-green vesuvianite, all from Italian Mountain, proper, are included in the collection. The matrix is in all cases a dense hornfels composed sometimes almost entirely of massive pale brown garnet, more frequently of a mixture of garnet and diopside, usually with a little interstitial calcite and a fibrous zeolite referred to scolecite. The vesuvianite does not appear as a constituent of the massive matrix but appears always to be a late introduction into the cavities. This mineral rests upon and is clearly later than crusts of pale buff grossularite garnet. Later minerals associated with and resting upon the vesuvianite are epidote, chabazite, and stilbite.

Selected clear green crystals of this type were analyzed in the Geological Survey laboratory by L. G. Eakins with the following results:

Analysis of vesuvianite

SiO_2	37.11
Al_2O_3	19.30
Fe_2O_3	3.31
MgO	3.89
CaO	36.24
H_2O	.06
F	.58
Total	100.49



FIGS. 8–9.—CRYSTALS OF VESUVIANITE

The specific gravity of the analyzed sample was 3.394 at 20°.

Another type of vesuvianite of quite different appearance forms a number of specimens, also from Italian Mountain. This is essentially a vesuvianite rock made up of greenish yellow acicular prisms of vesuvianite with interstitial calcite. The habit of one of the prisms which was terminated is shown in figure 8. This rock grades into patches of calcite in which small model-perfect brown short prismatic vesuvianite crystals averaging 2 mm. in length occur with small dodecahedral crystals of sulphur-yellow to greenish-yellow garnets.

A third and very unusual type of vesuvianite remains to be mentioned. Certain specimens showing large imperfect and somewhat

corroded crystals of the first type contain silky white fibrous material having the appearance of a zeolite. This is grown upon the vesuvianite crystal parallel to the vertical axis and apprently is replacing it. About 5 specimens show this material. When examined under the microscope the fibers are thin and of such extremely low birefringence that only very thick bundles are visible under crossed nicols. They have parallel extinction, positive elongation and a refractive index, approximately, of 1.717. The material of the fibers is evidently also vesuviante.

EPIDOTE

Epidote forms well terminated crystals varying somewhat in size, in cavities in anorthite, imperfect green or greenish-yellow columnar or acicular masses resting upon vesuvianite or on well developed diopside crystals and in cavities in massive diopside rock, between large grossularite garnets or in calcite veinlets cutting hornfels and altered shale.

The largest group of epidote-bearing specimens is that which has been mentioned beyond as consisting of anorthite cores partially replaced by adularia and containing numerous cavities in which the epidote occurs in crystals associated with titanite crystals, limonite pseudomorphs after pyrite, and scaly aggregates of chlorite. Many of the cavities are molds of a prismatic mineral of unknown identity which was removed before the later minerals were deposited. (No. 84560.) The epidote crystals vary in size from minute and comparatively perfect prisms with good terminations to a maximum observed size of 1 by 2 centimeters and the color varies from greenish-yellow to greenish-black. The mineral of one specimen of this lot was found to be biaxial and negative with 2V medium large, dispersion, r > v, strong. The refractive indices were roughly $\alpha=1.722$, $\beta=1.730$, $\delta=1.755$.

Another specimen shows an almost solid mass of epidote resting upon coarse vesuvianite. Cavities in this contain epidote crystals, which are rude prisms, deep yellow-green inside and light greenish-yellow outside. The suggestion of zoning in composition, obtained from the color distribution in these imperfect crystals is confirmed by their optical properties. When a whole crystal is crushed the grains are found to be biaxial negative, (−), with 2V varying from medium to large. The dispersion, r < v, varies from perceptible to strong, and the β index ranges from about 1.720 to 1.740. The grains show some twin lamellae. This powder gave no fluorine reaction in a closed tube with potassium bisulphate.

Aside from the most typical mode of occurrence of epidote in the anorthite-bearing masses, this mineral was found in several other associations. Not infrequently a small mass of columnar yellow-green material or a group of imperfect prisms is observed resting on good vesuvianite crystals in garnet-diopside hornfels. In a few specimens similar epidote is interstitial with relation to large poorly formed grossularite garnets. In several other cases radiated acicular greenish yellow epidote fills small seams and cavities in fine-grained massive diopside rock. In 2 specimens similar epidote rests on twinned diopside crystals and zoned garnets, and is overlain by calcite. One specimen contains deep yellowish green epidote in ill-defined crystals along the sides of a 1-centimeter calcite veinlet in altered shale.

Two analyses of epidote from this locality were made by Eakins. There is no record as to which specimens in the collection furnished the material for those analyses. The results obtained are as follows:

Analyses of epidote

[L. G. Eakins, analyst]

Constituent	1	2
	Per cent	*Per cent*
SiO_2	38. 21	37. 22
Al_2O_3	28. 70	24. 09
Fe_2O_3	8. 16	12. 80
FeO		. 79
MnO		. 11
MgO		Trace.
CaO	24. 30	23. 36
Na_2O	. 21	. 06
H_2O	. 10	1. 61
F	. 35	. 06
	100. 03	100. 10
Less O=F	. 15	. 02
Total	99. 88	100. 08

The most noteworthy feature of the analyses is the presence of fluorine, these being the first analyses to record fluorine in this mineral. The specific gravities recorded for the analyzed samples are 3.448 at 25° C. for the material of analysis 1 and 3.452 at 17° C. for the material of analysis 2.

ALBITE

Soda feldspar has been identified as a constituent of a number of specimens. In a mass of loosely aggregated large brown grossularite garnets small scattered imperfectly prismatic white crystals occur in a number of open spaces. This mineral is biaxial with 2V near

90° and varies from positive with dispersion r < v to negative with r > v. The β index of refraction similarly varies from about 1.530 to 1.540. The crystals are zoned in composition and show polysynthetic twin-lamellae. The material is evidently feldspar varying from nearly pure albite to oligoclase. Many of the crystals are partly covered with drusy crusts of minute crystals of heulandite. The feldspar is younger than the garnet and older than the heulandite.

Small and rather perfectly formed lutrous white albite crystals, not exceeding 2 mm. in diameter, occur sparsely scattered over the interior of a cavity in a single greatly altered specimen of garnet diopside rock (No. 84583).

The largest group of albite specimens is numbered 84583 and consists of pale pink crusts of drusy crystals averaging about 2 mm. broad by ½ mm. in thickness. The druses occur along open cracks in the centers of feldspar-filled seams in fine-grained altered diorite and the specimens show a layer of granular massive pink feldspar up to 1 cm. thick between the druse and the diorite. Under the microscope this albite is somewhat muddy from incipient kaolinization. It is biaxial positive (+) with 2V large, dispersion r < v weak, refractive indices α=1.525, β=1.530.

The crystals have a peculiar flat habit as is illustrated in the drawing, Figure 10, in which the notation follows the table of Brezina's elements in Goldschmidt's Winkeltabellen. The measurements are as follows:

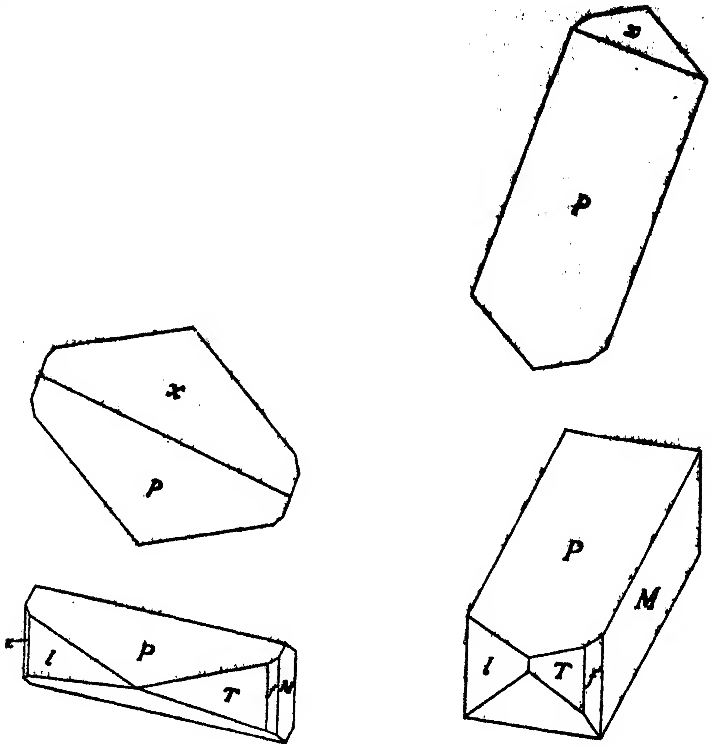
Crystal measurements of albite, Figure 10

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*P*	0	001	Fair, pearly	81 51	25 51	81 51	27 01
2	*M*	0∞	010	Poor	0 00	90 00	0 00	90 00
3	*T*	∞	110	Poor, blurred	57 19	91 53	60 30	90 00
4	*f*	∞3	130	Dim, poor	27 50	90 00	30 23	90 00
5	*l*	∞$\bar{\infty}$	$1\bar{1}0$	Good	119 15	90 00	119 52	90 00
6	*z*	∞$\bar{3}$	$1\bar{3}0$	do	149 07	90 00	149 44	90 00
7	*x*	−10	$\bar{1}01$	v. p. dull	n. s.	n. s.	80 54	24 12

Associated with or overlying the pink crusts of albite are chabazite in simple rhombohedrons or penetration twins up to 1½ mm. in diameter, minute rare quartz crystals of normal habit, and tiny honey-yellow crystals of titanite.

White albite ocurs in opaque crystals up to 1 mm. in size coating a banded rock which is probably a metamorphosed shale (84584).

This albite is overlain by the quartz crystals which resemble topaz, described below. The albite has the habit shown in the drawing, Figure 11.



10 11

FIGS. 10–11.—CRYSTALS OF ALBITE

ANORTHITE

Plagioclase feldspar very near the anorthite end of the series makes up an important part of a number of specimens although in none of these does it form good or attractive specimens worthy of inclusion in collections as anorthite. One group of specimens containing the measured crystals of titanite and the best epidote crystals consists largely of a translucent white mineral which is the earliest material and makes up the cores of the specimens. Optically this mineral is found to biaxial and negative (—) with 2V large, dispersion $r < v$ strong, extinction highly inclined against the cleavage. The birefringence is fairly low and the intermediate index of refraction, β, is $1.582 \pm .002$. This mineral is doubtless anorthite. It preserves hollow molds up to 2 cm., on an edge of their rhombic cross section, of a prismatic mineral which preceded the anorthite but was subsequently removed. Later the anorthite

was to a considerable degree replaced by a fine-grained chalky-appearing white mineral shown by its optical properties to be the adularia variety of orthoclase. Epidote, pyrite, titanite, and fine globular grayish chlorite were also deposited in the cavities. (No. 84560.)

Another lot (No. 84562) consists largely of whitish feldspar mixed with more or less pyrite, calcite, epidote, and an undetermined greenish silicate. The massive feldspar has the following optical properties which identify it as anorthite: Biaxial negative (−), 2V near 90°, dispersion $r < v$, weak. Refractive indices $\alpha=1.572$, $\beta=1.580$, $\gamma=1.585$. It shows a few narrow twin lamellae. Specimens Nos. 84560 and 84561 are similar. In a cavity in one specimen of this material are a few simple rhombohedral-appearing crystals up to 5 or 6 mm. in size. These are biaxial negative with 2V large, dispersion $r < v$, marked $\beta=1.582$. These show no twinning and resemble adularia crystals but are shown by their optical properties to also be anorthite.

ORTHOCLASE

Small white crystals of rhombohedral appearance and granular masses resting on and apparently replacing anorthite (No. 84560) and associated with epidote, titanite, pyrite—altered to limonite—and a globular gray chlorite are apparently the adularia variety of orthoclase. The adularia is probably older than the epidote and is definitely older than the titanite and chlorite. It is identified by its insolubility in acid and optical properties which are: Biaxial negative (−), dispersion $r < v$ strong, β about 1,520, λ=slightly above 1.53. Another specimen of the same number is a mass principally made up of whitish chalky-looking mineral showing indistinct lusterless crystals of rhombohedral appearance with epidote. The white mineral is biaxial and negative with 2V estimated at 60°. The dispersion, $r < v$, is perceptible and the indices measured are $\beta=1.531$, $\lambda=1,538$. This is probably albite.

Scattered white crystals with the rhombic appearing habit of adularia rest, in one specimen, upon a crust of little green garnets surfacing garnet hornfels. The white crystals, which vary up to 3 millimeters in diameter, are optically biaxial negative (−) with 2V medium, dispersion $r < v$ marked, indices well below 1.55. This mineral is doubtless orthoclase. It is later than the garnet and earlier than the associated pyrite, which is now altered to limonite pseudomorphs.

TITANITE

Titanite is a common mineral though in small crystals not readily seen without the aid of a lens. It occurs in a variety of situations and varies somewhat in habit.

The best crystals of titanite occur closely associated with the yellowish-green epidote, pyrite and fine-scaly grayish chlorite in vugs and cavities in whitish feldspar specimens the base of which consists of anorthite, to some extent replaced by orthoclase (No. 84561). The titanite crystals are small, most of them averaging only about 1 mm. and the largest not exceeding 3 mm. Many of them are pale yellow in color and from this they grade into a greenish yellow approaching that of the associated epidote. The crystals of this lot of specimens consist of both simple individuals and twins. One of the simple crystals of typical development is illustrated in Figure 12. As is shown these crystals are prismatic by elongation of the positive hemipyramid $n(111)$, a not uncommon habit for this mineral. The crystals of this habit were measured in several positions and that adopted in the drawing was finally found to be correct. The angles measured were as follows:

Measurements of titanite, Figure 12

Form		Symbol		Quality, description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*y*	0	001	Excellent	89 55	29 54	90 00	-------
2	*P*	∞0	100	Minute, poor	90 13	90 00	90 00	90 00
3	*r*	∞	110	Good	56 30	90 00	56 45	90 00
4	*n*	+1	111	Very good	65 39	63 53	65 30	64 06
5	*t*	−1	$\bar{1}11$	Poor	$\overline{40}$ 15	48 28	$\overline{40}$ 36	48 22

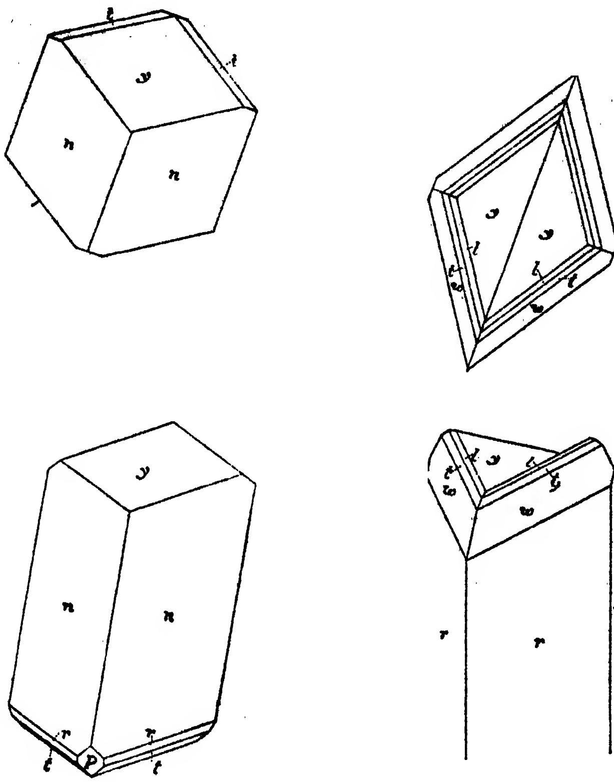
The twinned crystals occur with the untwinned ones and appear, except for the twinning, to have the same habit; but measurement of several twins in several positions showed that, while the direction of elongation of the simple crystals is parallel to $n(111)$, the twins are elongated parallel to the vertical axis, the twinning plane being $P(100)$, the commonest twinning plane for this species. A typical twin is illustrated in Figure 13. This gave the following angles:

Measurements of titanite (twin) Figure 13

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
					° ′	° ′	° ′	° ′
1	*y*	0	001	Excellent	90 05	29 25	90 00	-------
2	*P*	∞0	100	Very good	90 00	90 00	90 00	90 00
3	*r*	∞	110	Excellent	56 49	90 00	56 45	90 00
4	*l*	−½	$\bar{1}12$	Very poor	$\overline{11}$ 06	23 38	$\overline{10}$ 42	23 29
5	*t*	−1	$\bar{1}11$	Excellent	$\overline{40}$ 29	48 13	$\overline{40}$ 36	48 22
6	*w*	−2	$\bar{2}21$	do	$\overline{50}$ 09	69 30	$\overline{49}$ 59	69 22

The twinned crystal figure is drawn with (010) in front.

Very numerous minute honey-yellow titanite crystals of the common "envelope" habit occur impaled upon needles of byssolite hornblende or embedded in wool-like byssolite in a number of specimens consisting principally of byssolite, mizzonite, and scolecite (No. 84566) from Italian Mountain. A few little etched and



12 13

FIGS. 12–13.—CRYSTALS OF TITANITE

abraded titanite crystals 1 mm. or less in diameter rest upon a crust of albite (No. 84583) associated with a few distorted quartz crystals.

A few small (2 mm.) honey yellow perfect titanite crystals occur sparsely disseminated in apparently fresh diorite from the southeast slope of Cinnamon Mountain (No. 84563).

TALC

Small aggregates of pearly folia of greenish talc were noted in little cavities in granular magnetite (No. 84557) from North Italian Mountain. Other cavities in the magnetite contain minute greenish-yellow garnets.

CHLORITES

Several varieties of chlorite were seen in different specimens in this collection. Minute globules and aggregates of globules of a smoky-gray chloritic mineral occur on epidote, adularia, and titanite in the andradite specimens (No. 84560). The chlorite appears to be the youngest mineral of the specimens except pyrite.

A single flat specimen (No. 84570) consists largely of ill-defined inelastic blackish-green scales up to 3 millimeters across. Under the microscope these are mostly blue-green in basal plates but in considerable part they are oxidized to brownish-green. The few grains which could be turned on edge did not seem markedly pleochroic. The mineral is uniaxial and negative with the ω refractive index=1.60. This may be biotite but it looks more like a chlorite.

A single specimen shows numerous plates up to 1 centimeter across (No. 84570) of pale apple-green chlorite embedded in coarse calcite. These show repeated twinning on the same law which produces the common "A" or feather structure in mica. Under the microscope the material of these crystals is practically uniaxial and optically positive with an index of $\omega=1.578$. This is probably penninite.

A piece of banded rock, probably altered shale (No. 84571) is coated on one side with a druse of micaceous crystals up to 1 millimeter in diameter. These are hexagonal-prismatic with perfect micaceous cleavage. The prism faces are corroded and dull but the luster on the base is pearly and somewhat iridescent. Optically this mineral is biaxial and negative with 2V small to very-small, acute bisectrix (X) inclined slightly to the normal to the cleavage, indices, $\beta=1.570$. This is probably an iron-free chlorite.

MIZZONITE

Scapolite, all apparently of the variety mizzonite, makes up the bulk of a large number of specimens. The most striking lot of these (No. 84567—6 specimens) consists of large variously oriented prismatic masses or sheaves up to 4 by 10 cm. of ill-defined slightly divergent fibrous structure. This material varies from slightly purple to cream color where not stained by iron. The interstices between the masses of scapolite are filled with white calcite. Under the microscope the material of the scapolite masses, which under a lens appears pure, is found to consist of 3 minerals. The scapolite itself is in part clear and glassy, uniaxial and negative (—) with indices of refraction approximately $\epsilon=1.535$, $\omega=1.551-1.555$, indicating mizzonite. This mizzonite exhibits alteration or replacement

to a greater or less degree by a fine fibrous mineral which has developed parallel to the vertical axis. This mineral has negative elongation and an index of refraction of about 1.515 and is probably scolecite. Scattered clear grains which also occur in the powder are colorless and isotropic or with very feeble birefringence and an index of 1.485. This mineral is probably analcite. In a few cavities in these specimens considerable areas are covered with drusy terminations of perfect little heulandite crystals.

The second large lot of scapolite specimens (No. 84568—9 specimens) is labeled "scapolite in diorite, south slope of Sawtooth Range, Taylor R. Gunnison County." These contain veins of solid grayish-white compact scapolite up to 6 cm. wide with borders ⅔ cm. wide on each side of a mixture of scapolite and a green mineral, probably diopside. These cut fine grained diorite. The scapolite shows cleavage blades up to 1 by 6 cm. Under the microscope this scapolite is comparatively fresh and free from alteration. It is uniaxial negative (—). The refractive indices are, $\epsilon=1.542$, $\omega=1.558$, birefringence, $\omega-\epsilon=.016$.

The third group of specimens (84566), labeled "scapolite with byssolite, Italian Mountain," consist of loose textured masses of rude dirty white prisms up to 1 by 3 cm. forming a network, the interstices of which are filled with byssolitic hornblende. These prismoidal masses are to a large extent corroded and replaced by a dull fine-fibrous zeolite which has the properties of scolecite. Where they contain cores of unaltered material this is uniaxial negative with negative elongation; indices, $\epsilon=1.542$, $\omega=1.550$. The scolecite and byssolite, as well as the heulandite and titanite which occur in the cavities, are described elsewhere.

A single specimen (No. 84567) is largely composed of radiating fine columnar bundles of prismatic scapolite, white in color and slightly pearly in luster. The bundles average 1 cm. broad by 4 cm. in length. In vuggy parts of the specimen the scapolite forms rude crystals up to 3 by 15 mm. Pyrite, altered to lustrous limonite pseudomorphs, occurs in thickly scattered crystals up to 5 mm. in diameter, resting on the scapolite. Optically this scapolite is uniaxial negative with refractive indices of approximately $\epsilon=1.539$, $\varpi=1.549$, which indices indicate that it is mizzonite. Some alteration to scolecite gives parts of the scapolite lower indices and birefringence and a fibrous structure.

Another single specimen (No. 84567) shows rude white prismatic masses up to 8 by 20 mm. coating the face of a sheeted rock which is itself largely scapolite. This material has the refractive indices $\varpi=1.553$, $\epsilon=1.541$.

A sample of scapolite from Italian Mountain was analyzed by Eakins with the following results:

Analysis of mizzonite

SiO_2	57. 55
Al_2O_3	21. 53
Fe_2O_3	[illegible]
CaO	6. 18
K_2O	1. 64
Na_2O	7. 43
H_2O	3. 23
Cl	2. 82
	100. 38
O equivalent to Cl	. 63
Total	99. 75

The only data on which specimen of the several described above was used for the analysis is furnished by the statement that the analyzed material came from a gulch on the east side of Italian Mountain. It is presumed that the material first described, being the most showy and purest appearing, was selected for analysis. In this case the analyzed material doubtless contained an appreciable amount of zeolites, particularly scolecite, which would account for the high-water content shown.

QUARTZ

Quartz is rare and occurs in small crystals. The barite crystals of the barite specimen rest upon a crust of normal prismatic quartz in minute crystals. A few minute crystals of quartz of ordinary prismatic habit rest as a later deposit on the crusts of albite crystals of some of the specimens which contain pinkish albite in seams in diorite.

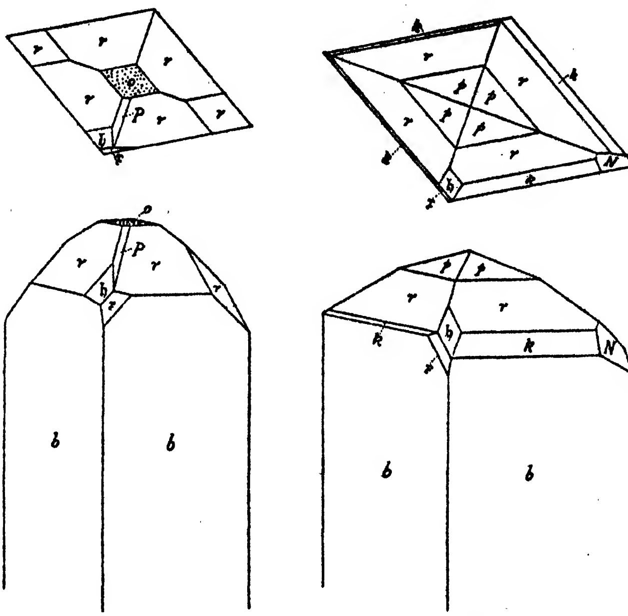
One specimen of albite is overlain by a few quartz crystals which, while minute and poorly developed, have such a peculiar habit as to merit notice. These have certain faces suppressed, giving them a habit so like topaz to lead to their being mistaken for that mineral until the crystal angles and optical properties had been measured. Two of the crystals which were measured are represented by Figures 14 and 15, the forms being tentatively identified as those of quartz by comparison with the angles of the Winkeltabellen. Actually the crystals are much less perfect than indicated in the figures, since, although the faces give good signals, the interfacial angles are largely replaced by rounded etched areas.

SCOLECITE

Although in no case forming good or attractive mineral specimens, the comparatively rare zeolite scolecite is the most common and

widely distributed zeolitic mineral of the Italian Mountain locality. It occurs not only associated with the other zeolites, chabazite and stilbite as a late deposit in cavities but is also common in minute cavities in the dense garnet hornfels which forms the matrix of the best vesuvianite specimens and replaces, to a greater or less extent, the mizzonite variety of scapolite in almost all specimens of the latter mineral.

In the hornfels which, in its cavities, bears the fine vesuvianite crystals, tiny vugs in massive pale-brown garnet which are lined with minute grossularite crystals are partly filled with a white fibrous zeolite which ranges from translucent compact radial or divergent fibrous



14 15

FIGS. 14–15.—CRYSTALS OF QUARTZ

tough material to loosely grouped separable fibers. The former continue out and terminate in the latter (No. 84553). The free fibers have negative elongation and a small inclined extinction, X $\wedge$ c=16°. The mineral is apparently optically negative, the birefringence is low, and the mean index of refraction is about 1.510. These properties identify the mineral as scolecite. The compact-fibrous material has the same index, birefringence, and elongation and, although the inclined extinction can not be seen, owing to the fine fibrous character, it is doubtless the same mineral. Another specimen of garnet-diopside hornfels which was examined contains abundant minute pores filled with a soft radial-fibrous white zeolite of the same prop-

erties, and it is probable that all of the fibrous white material in the hornfels is this mineral. This zeolite is of common occurrence in the best vesuvianite specimens not only in the hornfels but also in the cavities with the vesuvianite where it is always in small amount and never conspicuous. It forms thin fibrous crusts varying from dense and tough to aggregates of tufted cottony fibers. It rests upon vesuvianite and garnet but is clearly older than the chabazite which occurs in the same cavities. It is recognized, microscopically, by its negative elongation, small inclined extinction, medium low birefringence and index of refraction which approximates 1.51.

In the scapolite specimens the scolecite is even less well characterized. The best large specimens of scapolite (No. 84567) show no scolecite to the naked eye but look like large columnar masses of mizzonite with the interstices filled with calcite. Under the microscope, however, the mizzonite is seen to in large part be replaced by fibers parallel to the vertical axis, which have negative elongation, index approximating 1.515 and where coarse enough these show evidence of twinning and inclined extinction. Another large group of scapolite specimens consist of mizzonite prisms the interstices being filled with pale gray green byssolite. These masses of scapolite are also very largely replaced by the fibrous scolecite. These specimens (No. 84566) also show nearly lusterless masses of radiating fine white fibrous scolecite up to 2 cm. in maximum diameter. This fine-fibrous material is biaxial negative with small inclined extinction, $\alpha=1.510$, $\beta=1.515$, approximately. Occasionally the zeolite coarsens to lustrous acicular prisms. Under the microscope these all show twinning lamellæ like a plagioclase and all lie on a cleavage face approximately parallel to the optic axial pane. They show inclined extinction, $Z \wedge c=14°$ with $\alpha=1.512$, $\gamma=1.518$, approximately.

The scolecite occupying cavities with other zeolites is similar to the foregoing. In one specimen (No. 84545) a little white-radiating compact-pearly material resting on vesuvianite is clearly older than both stilbite and chabazite. A specimen (No. 84578) consisting largely of minute rosettes of pearly pale brown blades of stilbite has the latest cavities filled with radiating compact fibrous scolecite, apparently later than the stilbite. In another specimen sheaves of stilbite up to 7 or 8 mm. long (No. 84581) are underlain by rosettes up to 1 cm. across of fairly coarse radiated pearly needles. Under the microscope these fairly coarse needles show the twinning and inclined extinction, $X \wedge c=12°$. The mineral is biaxial negative, 2V moderate, refractive indices $\alpha=1.510$, $\beta=1.515$, $\lambda=1.516$. Another single specimen shows large crystals of sahlite projecting into a mass of stilbite and fine fibrous white scolecite. The stilbite forms minute pale brownish bladed rosettes apparently older than the

scolecite (No. 84580). The latter mineral forms radiating hemispheres, up to 1 cm. in diameter, of fine fibers of snow-white color. Under the microscope this fine fibrous material is somewhat opaque from included air but has negative elongation and apparently small inclined extinction with an index of refraction approximating 1.510.

The age relation of scolecite and stilbite seems reversible, sometimes one and sometimes the other being oldest.

A sample of scolecite was analyzed by Eakins, but which specimen furnished the material is not known. None of the specimens was originally catalogued as scolecite. The analysis gave the following results:

Analysis of scolecite

SiO_2	45.90
Al_2O_3	26.51
Fe_2O_3	-----
CaO	14.17
MgO	Trace
Na_2O	Trace
H_2O plus	13.79
Total	100.37

The specific gravity of the analyzed material is given as 2.247 at 17.2° C. The results of the analysis are almost in exact agreement with the theoretical composition of scolecite as given by Dana.

THOMSONITE

One specimen of this mineral forms a vein in altered diorite some 3 cm. in thickness. This is bordered by a 2 to 3 mm. crust of blackish green sahlite and is filled with broad plates of glistening specularite and a white zeolite in radiating pearly blades. Under the microscope the latter is colorless and free from alteration. It has a perfect cleavage upon which the plates lie and the acute bisectrix is perpendicular to this cleavage. The mineral is biaxial and positive (+) with $2V=50$ to $60°$, dispersion $r < v$, weak. The refractive indices are approximately, $\alpha=1.515$, $\beta=1.520$, $\gamma=1.538$, Birefringence$=0.023$. These properties indicate that the mineral is a variety of thomsonite.

STILBITE

Although less abundant that scolecite and chabazite, stilbite is common in the materials, usually as comparatively inconspicuous crystals, drusy crusts, or rosettes. In one or two specimens it is present as sheaves of such size and quality as to make fair stilbite specimens.

The stilbite is often associated with the grossular garnet or occurs in the cavities in the hornfels with vesuvianite and chabazite. In those specimens which contain the vesuvianite the stilbite often forms a single rosette of radiating blades in the cavity in garnet-diopside or garnet hornfels. Often associated with the rosette are a few crystals 2 mm. or less long of the common stilbite habit. One specimen contains scattered compound white pearly stilbite crystals up to 3 by 5 mm. in size projecting through and older than a crust of chabazite. The stilbite overlies some scolecite or rests upon vesuvianite in a cavity in hornfels. (No. 84545.)

Specimens of loosely aggregated masses of amber crystals of grossular garnet have all the interstices lined with drusy crusts of minute colorless crystals of stilbite of the usual habit. A similar mass of large brown garnets has thin drusy crysts made up of very minute sharp and colorless crystals of epidesmine habit, with heulandite, resting on garnet crystals or on albite which occurs in small amount. The grains of stilbite, under the microscope, lie on a perfect cleavage, which is parallel to the optic plane and show rectangular outline. The indices are $\alpha=1.486$, $\gamma=1.498$. The optic orientation, assuming the best cleavage to be (010) and the long direction vertical is $Z=a$, $Y=b$, $X \wedge c=3°$. In one case stilbite on garnet crystals is overlain by later chabazite and calcite. (No. 84551.) In one specimen small colorless stilbite crystals resting on a mass of the light colored grossular garnet are partly overlain by a thin coating of pinkish clay. The larger of the stilbites, which reach only 2 mm. in length, show normal habit—a rectangular prism determined by the front and side pinacoids with pearly luster on the broad face (010), surmounted by a basal pinacoid and with four truncating pyramid faces, the whole modified somewhat by the aggregate character with slight divergence. The smaller crystals of this specimen have a very unusual triclinic appearance. They are flat prismatic by elongation of the faces (100) and (010), truncated at the summit by a single oblique face, probably one face of the unit pyramid, developed to the exclusion of the other terminal faces.

In a few specimens the stilbite is the most conspicuous mineral. Its age relation to the other zeolites is not always clear. One specimen (No. 84575) shows a few obscure rosettes of blades of stilbite up to mm. in diameter, partly underlying a drusy crust of heulandite encrusting a dense whitish hornfels. This specimen is labeled heulandite from the Bidwell Range. Another specimen labeled as from Taylor Peak, Italian Mountain, consists largely of pale buff stilbite in small rosettes of radiating blades. This, when crushed and examined under the microscope, shows elongate fragments which lie on a good cleavage perpendicular to the optic nor-

mal or on a less perfect cleavage at right angles to this. This shows rather high birefringence and a considerable range in refractive indices, γ varying from 1.495 to 1.500. (No. 84578.) This stilbite incloses occasional small plates of specular hematite. It appears to have grown outward from the walls of open cavities, leaving some small unfilled centers which were later occupied by finely fibrous radiating white scolecite. Another specimen (No. 84580) from Taylor Peak shows very similar brownish stilbite and dense scolecite, but here the first lining of the cavity consists of large crystals of the sahlite variety of pyroxene. The best specimens of stilbite are from Taylor Peak, and consist of sheaves of divergent imperfect crystals of stilbite up to 6 or 7 mm. long, resting on much-altered dull and rusty diopside rock. These grow outward from radiations of coarse pearly needles of the zeolite here referred to scolecite, the stilbite in this case being distinctly younger than the scolecite, although elsewhere clearly older. Another specimen shows abundant stilbite in poorly developed crystals tending to form sheaves 2 by 1 mm. in size in calcite, which has exposed them by partly leaching away. (Nos. 84581, 84582.)

A sample of stilbite from the Italian Mountain collection was analyzed by Eakins with the following results:

Analysis of stilbite

SiO_2	57.75
Al_2O_3	16.64
CaO	8.58
Na_2O	Trace.
H_2O	17.17
Total	100.14

HEULANDITE

Heulandite occasionally makes up a fairly conspicuous constituent of a specimen and in many other cases occurs in small amount. One of the most showy specimens of heulandite in the collection (No. 84575) shows this zeolite occurring along a crack in massive coarse granular garnet rock. The heulandite forms large crystalline masses to 4 cm. long showing perfect cleavage in one direction with pearly luster on the cleavage face. Interspersed with these larger masses are also small, 1–2 mm., clear glassy perfectly developed crystals scattered sparsely over the rock or aggregated into small clusters. These have the habit of the "beaumontite" of Jones Falls, Maryland. The locality for this specimen is Bidwell Range, Gunnison County. Another specimen of heulandite having the same

number consists of a crust of heulandite coating a crack in reddish sandstone. The heulandite overlies a druse of small prismatic quartz crystals.

Minute heulandite crystals of "beaumontite" habit make up small drusy bristling masses overlying small greenish-buff crystals of grossular garnet. (No. 84553.) Other crystals too minute for their form to be made out make up radiating masses or drusy crusts on scattered albite in the interstices of a mass of large brown garnets. Optically these are biaxial positive with the acute bisectrix perpendicular to the most perfect cleavage. The axial angle approximates 50 to 60° and the crystals are zoned in refractive index the indices being approximately $\alpha = 1.486-1.490$, $\beta = 1.492$, $\gamma = 1.498$.

A large specimen of mizzonite has a cavity on one side lined over a considerable area by a drusy crust made up of perfect terminations of minute colorless heulandite crystals (No. 84567). Specimens composed principally of mizzonite, scolecite, and byssolite (No. 84566) contain small hexagonal-appearing crystals embedded in the byssolite. These reach 3–4 mm. in diameter, are pearly lustered on the broad face and are colored greenish by included fibers of byssolite. Under the microscope their material is colorless, shows low birefringence and rests upon a perfect cleavage which is perpendicular to the acute bisectrix. The mineral is optically positive with 2V very small, dispersion $r < v$ perceptible, $\beta = 1.500$. This mineral is doubtless heulandite.

CHABAZITE

Chabazite occurs most commonly in the cavities in the vesuvianite specimens where it overlies vesuvianite crystals and is almost an invariable associate of this mineral. It forms white crystals, mostly simple rhombohedrons with a few penetration twins which vary from 1 to 5 millimeters or more on an edge. Many of these are almost model-perfect. While chabazite is the most abundant zeolite in these cavities it is often associated with small amounts of stilbite and scolecite, both of which seem to be older than the chabazite.

In one specimen a few small rhombohedral crystals are associated with scattered quartz and titanite crystals overlying a druse of albite.

Another specimen (84572) from the south slope of the Sawtooth Range has colorless to white simple rhombohedral crystals of chabazite up to 2 millimeters in diameter coating one broad surface of a mass of unaltered diorite.

Under the microscope the material associated with the vesuvianite shows very low birefringence and a refractive index of about 1.482–1.484.

GRAPHITE

A specimen (No. 84552) from North Italian Mountain is a schist which in places is largely massive graphite. This probably represents a highly metamorphosed carbonaceous shale. It contains very numerous black dodecahedral garnets up to 5 mm. in diameter.

MAGNETITE

Magnetite, in massive granular form, makes up the bulk of several specimens from North Italian Mountain (No. 84557). The magnetite masses contain numerous small cavities which contain small masses of pearly talc folia or are lined with tiny sulphur-yellow garnet crystals.

HEMATITE

Small aggregates of thin tabular plates of specular hematite occur in specimens consisting chiefly of acicular vesuvianite in calcite (No. 84554). Another specimen shows minute specularite plates in masses composed of fine rosettes of radiating pale brown stilbite blades. The largest plates of this mineral reach 2 cm. in breadth and are contained in thomsonite in sahlite-bordered veinlets in altered diorite.

CHALCEDONY

Chalcedony was noted in two specimens (No. 84560). In the first of these a peculiar rounded mass 8 mm. in diameter, of grayish-white chalcedony folds around and partly encloses imperfect epidote prisms in a cavity in a mass of translucent epidote. The second specimen shows a very similar mass of chalcedony of the same size resting on adularia in an adularia-epidote mass.

SIDERITE

A single specimen of buff limestone contains cavities lined with minute saddle-shaped siderite crystals. These are brown in color and iridescent with a more or less metallic luster. They are overlain by scalenohedral crystals of calcite. (No. 84573.)

ANKERITE

A specimen of bluish-gray impure limestone contains veins of carbonate up to 4 or 5 cm. thick. White scalenohedral calcite crystals rest on a brown-weathering crust 1 cm. or less in thickness. This contains cavities lined with minute saddle-shaped crystals. This mineral is probably iron-bearing dolomite or ankerite.

CALCITE

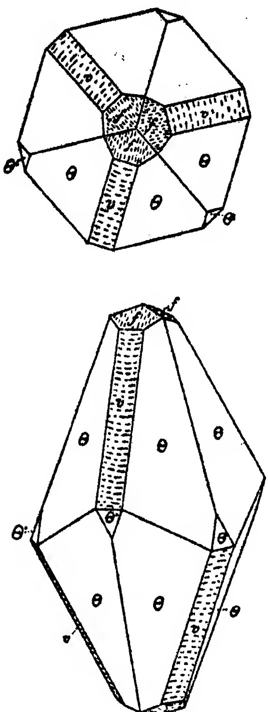
Calcite occurs as colorless "dogtooth" crystals averaging 5 mm. or more in length lining open cavities in seams in a dark gray limestone containing abundant finely disseminated pyrite. The calcite overlies a first lining of the open spaces which consists of a ferriferous dolomite or ankerite which weathers brown and, where it forms free surfaces, develops saddle-shaped aggregates of curved rhombohedral crystals. The calcite is all of similar habit and is rather simple, the forms present being $(11\bar{2}2)$, $(22\bar{4}1)$, $(\bar{4}481)$, and $(\bar{4}151)$. The habit is essentially as shown in the drawing, Figure 16. The faces of $f(11\bar{2}2)$ are striated vertically as shown and give poor reflections. $v(22\bar{4}1)$ is rounded and gives no signals but was identified by its zonal position. The other faces are bright.

PYRITE

Pyrite is generally distributed in the specimens associated with nearly all of the other minerals. It forms scattered crystals up to nearly 1 cm. in diameter, practically all of which have been completely altered and are now glossy pseudomorphs of hard vitreous limonite. While the crystal form is in a few places dominated by the pyritohedron or octahedron, the majority of the crystals are of complex appearance, and their development is probably controlled by diploids. The crystallography was not completely worked out.

Indistinct small crystals of pyrite altered to limonite occur in small vugs in massive garnet rock, overlying small crystals of grossularite. Scolecite and a little chabazite are associated with the pyrite and appear to be later than it (No. 84553). Scattered crystals of pyrite occur in cavities in specimens containing anorthite, adularia, titanite, epidote, and chlorite. The pyrite crystals, which reach 8 mm. in diameter and are of complex form, are probably the last mineral deposited in this assemblage. They are altered to limonite pseudomorphs (No. 84560). Similarly pyrite crystals up to 1 cm. in diameter occur in coarse brown grossularite garnet (No. 84559). Pyrite crystals ranging from minute to a diameter of 2 mm., the form of which is dominated by the pyritohedron, rest upon a crust of small green garnets. These are younger than the adularia crystals of the same specimen (No. 84576). Complex pyrite pseudomorphs, 3 mm. in diameter, which rest on vesuvianite, are apparently older than the prismatic quartz crystals which line the same cavity (No. 84559). Crystals up to 5 mm. in diameter rest upon mizzonite in a specimen composed of radiating mizzonite prisms (No. 84567).

While all of the preceding specimens are described as pyrite, no fresh pyrite remains in them, this mineral in all these cases being now represented by perfect pseudomorphs of limonite. Unaltered pyrite was, however, observed in a few specimens. Embedded imperfect pyrite crystals up to 4 mm. in diameter occur in limestone which contains vugs lined with siderite and calcite (No. 84573), and



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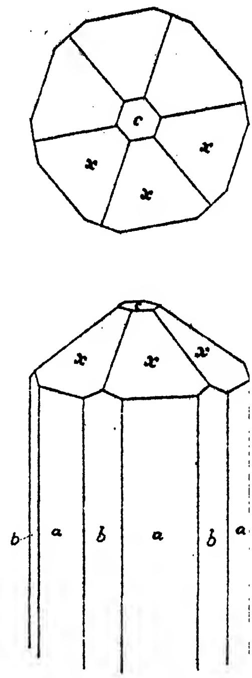


17

FIGS. 16–17.—16, CRYSTAL OF CALCITE. 17, CRYSTAL OF APATITE

another specimen of the same number shows a thin layer of fresh pyrite underlying a crust of calcite crystals resting on unaltered limestone. A specimen (No. 84562) consisting principally of anorthite contains scattered partly altered grains and imperfect crystals.

APATITE

Apatite forms small yellowish-white to colorless transparent crystals up to 3 mm. in diameter by 6 mm. long interspersed with sahlite crystals in cavities in solid masses of sahlite and occurs also as transparent pale greenish crystals embedded in calcite and ill-defined brownish masses up to 2 cm. long embedded in sahlite

rock. The former crystals have the habit illustrated in Figure 17. The measurements obtained on such a crystal are as follows:

Measurements of apatite, Figure 17

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		ϕ	ρ	ϕ	ρ
					° ′	° ′	° ′	° ′
1	*c*	0	0001	Very good	--------	0 00	--------	0 00
2	*a*	∞0	10$\bar{1}$0	Excellent	0 00	90 00	0 00	90 00
3	*b*	∞	11$\bar{2}$0	Good	30 00	90 00	30 00	90 00
4	*x*	10	10$\bar{1}$1	Excellent	0 00	40 10	0 00	40 16

Optically this apatite is uniaxial with the refractive index $\omega=1.634$.

BARITE

Barite is present in a single specimen (No. 84569) where it coats opposite surfaces of a mass of dense metamorphosed sedimentary rock. The crystals are flattened as though they had grown in a constricted space and reach a maximum size of about 8 mm. Crystals split on the basal cleavage show zoning in more and less transparent layers parallel to the unit prism. The crystals are very poorly defined and are bounded only by the prism *m*(110) and the base *c*(001). This gives them a rhombohedral appearance and they greatly resemble chabazite.

EXPLANATION OF PLATES

Plate 1

Upper left: Flattened barite crystals of rhombic outline resembling chabazite coating surface of rock along fracture.

Upper right: Twinned crystals of diopside lining cavity in diopside hornfels.

Lower: Coarse crystalline columnar mass of scapolite partially replaced by scolecite.

Plate 2

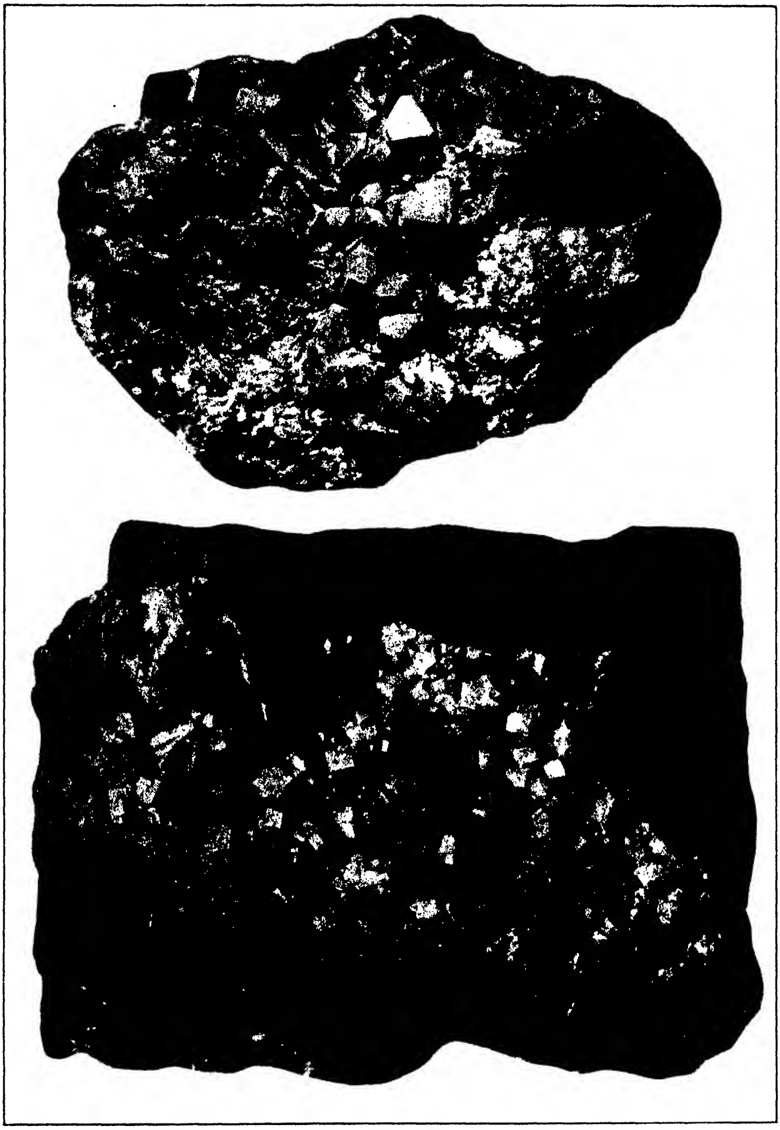
Upper: Perfect crystals of vesuvianite lining cavity in diopside rock.

Lower: Rhombohedral crystals of chabazite, crystals of vesuvianite and a rosette of stilbite in a vug in massive diopside rock.

O

BARITE, DIOPSIDE, AND SCAPOLITE

FOR EXPLANATION OF PLATE SEE PAGE 42



VESUVIANITE, CHABAZITE, AND STILBITE

FOR EXPLANATION OF PLATE SEE PAGE 42

THE AMERICAN MOTHS OF THE GENUS DIATRAEA AND ALLIES

By Harrison G. Dyar
Custodian of Lepidoptera, United States National Museum

and

Carl Heinrich
Of the Bureau of Entomology, United States Department of Agriculture

INTRODUCTION

The genus *Diatraea* contains a considerable number of species of moths, and is distributed throughout the world, especially in the tropical portions. The larvae are borers in the stems of various grasses, and several species have attracted attention from an economic point of view by their depredations upon sugar cane and Indian corn.

We consider here the American species only; but we have not confined ourselves strictly to the limits of the genus *Diatraea*. This genus belongs to the family Pyralidae, subfamily Crambinae, and to that section of the subfamily in which vein 7 of the fore wing arises from the discal cell. Among the genera so characterized are some in which vein 11 of the fore wing anastomoses with vein 12, which group includes *Diatraea;* we herewith treat this whole group, although recognizing that it is not a natural one, the anastomosing of veins 11 and 12 having occurred twice in different lines of descent. In addition to these, we include observations on certain more distantly related forms whose position requires correcting, or the larvae of which have been reported from cane or corn.

Ten genera and 56 species are treated in this paper, of which 5 genera and 12 species are described as new. Ten names are added to the synonymy and three species described in *Diatraea* are unrecognized and omitted from our keys. They are briefly treated at the end of the paper. Five species which have been described in or referred to *Diatraea* we are transferring to other genera.

The genera allied to *Diatraea* may be separated as follows:

KEY TO THE GENERA HERE CONSIDERED

Fore wing with vein 7 from cell; vein 11 anastomosing with vein 12

1. Ocelli absent ---------- 2
   Ocelli present ---------- 6
2. Vein 10 stalked with veins 8–9 ---------- **Iesta** Dyar (p. 4)
   Vein 10 from cell ---------- 3
3. Fore wing with veins 4–5 stalked; antennae of male pectinate. **Trinidadia** Dyar and Heinrich (p. 5)
   Fore wing with veins 4–5 not stalked; male antennae simple ---------- 4
4. Hind wing with veins 4–5 connate or short stalked ---------- 5
   Hind wing with veins 3, 4, and 5 separate at end of cell. **Hemiplatytes** Barnes and Benjamin (p. 28)
5. Labial palpi short, not exceeding the maxillary. **Xanthopherne** Dyar and Heinrich (p. 29)
   Labial palpi very long ---------- **Diatraea** Guilding (p. 6)
6. Hind wing with vein 6 arising below apex of cell, remote from veins 7–8. **Silveria** Dyar (p. 31)
   Hind wing with vein 6 arising from apex of cell, close to veins 7–8 ---------- 7
7. Wings trigonate, normal ---------- **Haimbachia** Dyar (p. 32)
   Wings long and narrow ---------- **Alamogordia** Dyar and Heinrich (p. 38)

GENITALIC CHARACTERS

The genitalia of the Crambinae offer excellent characters for the separation of species and to some extent (especially in the males) of genera. The generic characters, however, are more in habitus than definable structural differences; and are further obscured by the fact that in the genus *Chilo* most of the types of the other allied genera are repeated. We are unable to give any genitalic description that will hold for all the members of the *Diatraea* group and exclude genera with veins 11 and 12 of fore wing free or with 7 stalked with 8 and 9. The following general characters apply to the Crambinae as a whole:

Male genitalia with vinculum enlarged ventrally and strongly chitinized. Harpe simple and elongately triangular or divided and with costa produced as a free strongly chitinized arm, lobe, or hook; costa most strongly chitinized part; cucullus not differentiated from median area, both areas weakly chitinized and finely haired; sacculus much reduced, rather weakly chitinized and without hair tufts or strong spines, never produced as a free arm. Uncus strongly chitinized, stout, broad at base; articulation to tegumen strongly marked. Gnathos strongly chitinized; closely hinged to base of uncus; movable; produced into a strong hook or tongue; never divided. Uncus and gnathos, together, cheliform in appearance. Socii absent. Transtilla absent; or represented only by its divided

elements (slight projections from costal bases of harpes). Anellus a flattened or semitubular plate, often with strongly developed lateral arms and sometimes a central projection; sometimes hinged to harpes (*Argyria*, *Silveria*); frequently divided, with one element represented as a triangular or oval plate (juxta) lying between the bases of the sacculi of the harpes. Aedoeagus straight or but slightly bent, moderately long; with slight blind sack; cornuti usually present, variously developed but never deciduous.

Female genitalia with ductus bursae normally straight; rarely sigmoid (*Ommatopteryx*); short or moderately long, and chitinized at or toward genital opening. Ovipositor never aculeate, rarely telescopic. Genital plate when present simple, often absent.

In preparing slides of crambid male genitalia it is usually necessary to dissect the several parts and mount them in different positions. The characters of harpe, vinculum, and anellus show best, as a rule, spread and viewed ventrally; while the tegumen, uncus, and gnathos must often be viewed laterally or from a three-quarters projection to show distinguishing characters to the best advantage. We have therefore figured the male organs as dissected rather than complete; giving such views of the several parts as will best display their characters. The peculiarities of position in each case are stated in the explanation of plates.

In description of the parts we have followed the terminology proposed by Busck and Heinrich [1] and used by them in previous papers dealing with lepidopterous genitalia.

LARVAE

Only six of the 56 species here treated are represented by larvae in the National Collection. These are all in the genus *Diatraea* (*saccharalis*, *zeacolella*, *canella*, *grandiosella*, *magnifactella*, *lineolata*); and two of these (*magnifactella* and *lineolata*) are of doubtful determination. It is not possible therefore to give anything in the way of a larval classification; nor even a satisfactory specific description which will certainly identify any of the represented species. In another place [2] the junior author has given descriptions of the larvae of our two economically most important North American species (*saccharalis* and *zeacolella*); but these descriptions will only serve to distinguish the forms described from each other. The various *Diatraea* larvae vary so little from species to species and the seasonal dimorphism is so marked within each species that it is necessary to have more material before specific characters can be determined.

[1] Proc. Ent. Soc. Washington, vol. 23, June, 1921, pp. 145–152.
[2] Bull. 746. U. S. Dept. Agr., 1919.

DESCRIPTIONS OF GENERA AND SPECIES

Genus IESTA Dyar

Iesta DYAR, Proc. Ent. Soc. Washington, vol. 11, 1909, p. 29.—FORBES, Journ. New York Ent. Soc., vol. 28, 1920, p. 224.

Diatraerupa SCHAUS, Ann. Mag. Nat. Hist., ser. 8, vol. 11, 1913, p. 240. (Type *guapilella* Schaus.)

Essentially as in *Diatraea*, differing only in the stalking of vein 10 in fore wing. Front flat, smooth. Labial palpi porrect and downcurved, extending over twice the length of the head. No ocelli. Antennae filiform, somewhat thicker in the male than the female. Fore wing with vein 3 from long before end of cell; 4 and 5 shortly stalked; 6 below apex of cell; 7 at apex; 8–10 stalked from before apex of cell. Hind wing with vein 3 before end of cell; 4 and 5 rather long-stalked; the cross-vein inwardly strongly oblique; 6 from apex of cell, running close to the stalk of 7 and 8, which separate only near apex of wing.

The genitalia offer no generic characters to distinguish from *Diatraea*.

Male with vinculum elongately triangular. Harpe undivided; elongately triangular; costa with a large, smooth basal projection, excavate beyond, only moderately chitinized.

Female with ductus bursae short, weakly chitinized in type, more strongly so in other species. Bursa large, elongate; without signum. Ovipositors and supporting rods normal.

Abdomen of male with pair of lateral tufts on second segment.

Genotype.—*Iesta lisetta* Dyar.

KEY TO THE SPECIES OF IESTA

1. Fore wing whitish straw color with two parallel outer lines, discal and terminal dots .... lisetta Dyar (p. 4)
   Fore wing rusty-brown shaded 2
2. A distinct outer line .... morobe Dyar (p. 5)
   This line obsolete .... gaupilella (Schaus) (p. 5)

IESTA LISETTA Dyar

Figures 28, 47

Iesta lisetta DYAR, Proc. Ent. Soc. Washington, vol. 11, 1909, p. 29.—BARNES and McDONNOUGH, List Lepid. Bor. Amer., No. 5435, 1917.

Iesta cancellalis DYAR, Proc. U. S. Nat. Mus., vol. 47, 1914, p. 320.

Iesta adulcia DYAR, Proc. U. S. Nat. Mus., vol. 51, 1916, p. 37.

A small species with distinct *Diatraea* markings; the larva and life history unknown. We are unable to distinguish *cancellalis* from Panama or *adulcia* from southern Mexico and Guatemala from *lisetta* from southern Florida, and have consequently placed them together as one species.

Genitalia figured from specimens from Lakeland, Fla. (male), and Orlanda, Fla. (female).

Types.—In National Collection.

Type localities.—Dade City, Fla. (*lisetta*); Corozal, Canal Zone, Panama (*cancellalis*); Teapa, Tabasco, Mexico (*adulcia*).

IESTA MOROBE Dyar

Figure 46

Iesta morobe DYAR, Proc. U. S. Nat. Mus., vol. 51, 1916, p. 37.

Only the female type is before us, differing from *guapilella* in the presence of a distinct outer line.

Male, larva and life history unknown. This may prove to be a varietal form of *guapilella* with which it agrees in genitalia.

Genitalia of type figured.

Type.—In National Collection.

Type locality.—Teapa, Tabasco, Mexico.

IESTA GUAPILELLA (Schaus)

Diatraerupa guapilella SCHAUS, Ann. Mag. Nat. Hist., ser. 8, vol. 11, 1913, p. 240.

Only the female type is before us.

Male, larva and life history unknown.

Female genitalia similar to those of *lisetta* except for a stronger chitinization of the ductus and neck of bursa.

Type.—In National Collection.

Type locality.—Guapiles, Costa Rica.

TRINIDADIA, new genus

Front slightly bulging, smooth. Labial palpi porrect and downcurved, extending over twice the length of the head. No ocelli. Maxillary palpi triangularly dilated with scales. Antennae long, pectinate-pubescent in the male, filiform in the female. Fore wing with vein 3 from well before end of cell; 4 and 5 stalked; 6 well below apex of cell; 7 from apex of cell; 8 and 9 long stalked from apex; 10 from before the apex; 11 anastomosing with 12. Hind wing with vein 3 from well before end of cell; 4–5 long stalked; 6 from apex of cell; 7 anastomosing with 8.

The genitalia show no characters to distinguish the genus from *Diatraea* or *Iesta.* The genitalia of the type, however, easily distinguish it specifically from anything in either of these genera; and the hind wing venation and strongly pectinate antennae readily separate the genus.

Genotype.—*Diatraea minimifacta* Dyar.

TRINIDADIA MINIMIFACTA (Dyar)

Figures 29, 48

Diatraea minimifacta DYAR, Ent. News, vol. 22, 1911, p. 202.

A small species with *Diatraea* markings. The males have the fore wings whitish, with the usual lines well relieved but running into a brown shade costally where they seem to join. In the female the fore wing is heavily overspread with brown.

Expanse.—Male, 14–17 mm.; female, 16–19 mm.

Three males and three females are before us; from Trinidad; from St. Jean and Cayenne, French Guiana.

The larva and life history are unknown.

Genitalia figured from specimens from the type locality.

Abdomen of male without tufts on second joint.

Type.—In National Collection.

Type locality.—Trinidad, British West Indies.

Genus DIATRAEA Guilding

Diatraea GUILDING, Trans. Soc. Encour. Arts, vol. 46, 1832, p. 143.—ZELLER, Hor. Ent. Ross., vol. 16, 1881, p. 161.—HAMPSON, Proc. Zool. Soc. London, vol. 60, 1895, p. 953.—FERNALD, Cramb. N. Amer., Bull. Mass. Agr. Coll., 1896, p. 73.—DYAR, Ent. News, vol. 22, 1911, pp. 199–297.—FORBES, Journ. New York Ent. Soc., vol. 28, 1920, p. 224; Mem. 68, Cornell Univ., Agr. Exp. Sta., 1923, p. 590.

Front either flat and smooth, bulging, tuberculate or strongly cone shaped. No ocelli. Labial palpi porrect and down-curved, smooth, beaklike, extending over twice the length of head. Maxillary palpi triangularly dilated with scales. Antennae somewhat thickened and minutely pubescent in the male, filiform in the female. Fore wing with vein 3 before angle of cell; 4 and 5 separate at origin; 6 below apex of cell; 7 at apex; 8–9 stalked from before end of cell; 10 arising shortly basally thereof; 11 anastomosing with 12. Hind wing with veins 4–5 connate or very shortly stalked from the sharp angle of the cell; 6 from apex of cell, close to the stalk of 7–8.

Male genitalia with vinculum rounded or triangular. Harpe undivided, elongately triangular; costa simple or with variously modified basal or subbasal (or both basal and subbasal) projections. Uncus normally triangular, with apex pointed or broadened; sometimes greatly broadened. (Figs. 15, 22.) Gnathos normally triangular (beak like), with more or less spining toward apex; greatly broadened toward apex only when uncus is similarly modified. Tegumen often with basal or subbasal lateral lobes. Anellus a flattened or but slightly curved plate with well-developed lateral arms, and sometimes with a central projection; divided, with one element a small triangular or oval plate (juxta) lying between the bases of

sacculi of harpes; never hinged to vinculum or rigidly attached to harpes.

Female genitalia with ductus bursae very short, chitinized. Bursa copulatrix large; chitinized at juncture with ductus (heavily so in a few species), the chitizination covering upper half of bursa in *strigipennella* Dyar and the oriental *venosata* Walker; in the former there is also an internal median girdle of serrate chitinous ridges (fig. 66); without signum. Ovipositor and supporting rods normal.

Abdomen of male with or without a pair of lateral hair tufts (*X*, fig. 1) on caudal margin of second segment.

Genotype.—Phalaena saccharalis Fabricius.

KEY TO THE SPECIES OF DIATRAEA ON COLORATION AND STRUCTURE OF THE FRONT

1. Fore wing straw-colored or brownish with two oblique lines, more distinct in the male than the female; veins not lined ---- 2
   Fore wing straw-colored, brownish, or gray; veins conspicuously lined; cross marks absent or subordinated ---- 15
2. Oblique lines dotted, subparallel ---- 3
   Oblique lines shaded or obscurely rounded and confluent costally ---- 12
3. Front without a tubercle ---- 4
   Front with a tubercle ---- 8
4. Large; light straw-colored; dots of lines distinctly separated. **instructella** Dyar (p. 10)
   Smaller; brownish straw-colored; dots of lines not distinctly separated ---- 5
5. Hind wing nearly white ---- 6
   Hind wing fuscous brown shaded with traces of outer line ---- 7
6. Male without hair tufts on the tibiae ---- **saccharalis** (Fabricius) (p. 11)
   Male with hair tufts on hind tibiae ---- **pedibarbata** Dyar (p. 12); ? **incomparella** Dyar and Heinrich (p. 13)
7. Hind wing paler than fore wing ---- **zeacolella** Dyar (p. 19)
   Hind wing as dark as fore wing ---- **postlineella** Schaus (p. 20)
8. Fore wing gray-brown, reddish suffused ---- 9
   Fore wing yellow-brown ---- 10
9. Wing broad, marks distinct; inner line less distinct than outer. **canella** Hampson (p. 20)
   Wing narrow; marks blurred ---- **amnemonella** Dyar (p. 21); **castrensis** Dyar and Heinrich (p. 28)
10. Large; male 30–33 mm.; hind wing darker than fore wing. **magnifactella** Dyar (p. 14)
    Smaller; male 17–28 mm.; hind wing paler than fore wing ---- 11
11. Male with inner line blotched below end of cell ---- **guatemalella** Schaus (p. 14)
    Male with inner line not so blotched ---- **tabernella** Dyar (p. 15)
12. Front without a tubercle ---- 13
    Front with a tubercle ---- 14
13. Large; female 29 mm ---- **centinens** Dyar (p. 15)
    Smaller; female 16–18 mm ---- **gaga** Dyar (p. 18)
14. Outer line denticulate, leaving clear yellow area at tornus. **maronialis** Schaus (p. 23)
    Outer line shaded; no discolorous tornal area ---- **umbrialis** Schaus (p. 23)
15. Front without a tubercle ---- 16
    Front with a tubercle ---- 18
16. Ground color whitish; veins strongly contrasted ---- 17
    Ground color brown; veins not strongly contrasted ---- **evanescens** Dyar (p. 18)

17. Small; 15–18 mm.; discal dot distinct ---------- **venosalis** (Dyar) (p. 22)
Large; 25–36 mm.; discal dot not contrasted ----- **grandiosella** Dyar (p. 25)
18. Dotted cross lines present ---------- 19
Cross lines absent ---------- 20
19. Cross lines almost normal, though dominated by the vein linings.
{**fuscella** Schaus (p. 22)
{**indigenella** Dyar and Heinrich (p. 13)
Cross lines formed by intensified vein-streaks ---- **bellifactella** Dyar (p. 26)
20. Ground color yellow or yellow-brown ---------- 21
{**strigipennella** Dyar (p. 27)
Ground color grayish ---------- {**cayennella** Dyar and Heinrich (p. 27)
{**anathericola** Dyar and Heinrich (p. 21)
{**pallidostricta** Dyar (p. 16)
21. Markings rather contrasted and mottled. **schausella** Dyar and Heinrich (p. 24)
{**busckella** Dyar and Heinrich (p. 16)
Markings generally uniform ---------- 22
{**lineolata** (Walker) (p. 24)
22. Ground color light yellow. **moorella** Dyar and Heinrich (p. 17)
{**muellerella** Dyar and Heinrich (p. 25)
Ground color dark brownish shaded ---------- **angustella** Dyar (p. 17)

KEY TO THE SPECIES OF DIATRAEA ON CHARACTERS OF THE GENITALIA—MALES

1. Tegumen with lateral lobes ---------- 2
Tegumen without lateral lobes ---------- 7
2. Harpe with knob-like projection from base of costa ---------- 3
Harpe without costal projection ---------- **evanescens** Dyar (p. 18)
3. Lateral lobes with apices broadly rounded ---------- 4
Lateral lobes with apices pointed ---------- 5
Lateral lobes with apices truncate ---------- **magnifactella** Dyar (p. 14)
4. Lateral lobes broad, as broad as long ------- **saccharalis** (Fabricius) (p. 11)
Lateral lobes narrow, longer than broad ---------- **tabernella** Dyar (p. 15)
5. Lateral lobes subtriangular and bluntly pointed.
busckella Dyar and Heinrich (p. 16)
Lateral lobes triangular and rather sharply pointed ---------- 6
6. Basal costal lobe of harpe finely scobinate { **angustella** Dyar (p. 17)
{ **moorella** Dyar and Heinrich (p. 17)
Basal costal lobe of harpe coarsely scobinate -- **guatemalella** Schaus (p. 14)
Basal costal lobe of harpe somewhat roughened, but not scobinate.
pedibarbata Dyar (p. 12)
7. Anellus with well developed central projection ---------- 8
Anellus without central projection ---------- 11
8. Uncus bilobed and with broadened apex ---------- **bellifactella** Dyar (p. 26)
Uncus beak-like, with apex pointed ---------- 9
9. Central projection of anellus finely spined; a single projection from costa of harpe ---------- **strigipennella** Dyar (p. 27)
Central projection of anellus smooth; a double projection from costa of harpe ---------- 10
10. Hook-like projection from extreme base of costa of harpe, broad, flattened and serrate ---------- **cayenella** Dyar and Heinrich (p. 27)
Hook-like projection from base of costa, narrow, rounded and smooth
castrensis Dyar and Heinrich (p. 28)
11. Lateral arms of anellus greatly broadened toward apices.
lineolata (Walker) (p. 24)
Lateral arms of anellus not broadened toward apices ---------- 12

12. Lateral arms with subapical spur ---------- 13
Lateral arms without subapical spur ---------- 15
13. Apex of uncus broadened ---------- grandiosella Dyar (p. 25)
Apex of uncus bluntly pointed ---------- 14
14. Gnathos as long as uncus; with a strong inner spur before apex
muellerella Dyar and Heinrich (p. 25)
Gnathos shorter than uncus; without inner spur
schausella Dyar and Heinrich (p. 24)
15. Harpe with a smooth digitate, subbasal projection from costa ---------- 16
Harpe without subbasal projection from costa ---------- 17
16. Costal projection of harpe over three times as long as broad.
{canella Hampson (p. 20)
{anathericola Dyar and Heinrich (p. 21)
Costal projection of harpe less than twice as long as broad.
amnemonella Dyar (p. 21)
17. Gnathos decidedly broadened toward apex ---------- fuscella Schaus (p. 22)
Gnathos terminating in a strong, up-curved hook ---------- 18
Gnathos beak-like (slender and tapering to extremity) ---------- 19
18. Uncus with lateral flaps and dilated at apex ---------- zeacolella Dyar (p. 19)
Uncus without lateral flaps and bluntly pointed at apex.
postlineella Schaus (p. 20)
19. Harpe with a slight triangular projection from base of costa.
maronialis Schaus (p. 23)
Harpe without triangular projection from base of costa ---------- 20
20. Gnathos with little or no spining near apex ---------- gaga Dyar (p. 18)
Gnathos with appreciable spining near apex ---------- venosalis (Dyar) (p. 22)

FEMALES

1. Genital opening with a chitinous shield projecting from its lower margin, or a strong chitinization in the depressed area immediately behind it, or with genital opening itself greatly widened ---------- 2
Genital opening otherwise; sometimes with a thin broken ring about mouth, or with lateral edges of mouth very slightly raised and chitinized, but normally simple; genital opening of normal size ---------- 12
2. Genital opening greatly widened ---------- guatemalella Schaus (p. 14)
Genital opening of normal size ---------- 3
3. Bursa copulatrix with half of one side toward ductus strongly chitinized and with an internal median girdle of serrate ridges.
strigipennella Dyar (p. 27)
Bursa copulatrix normal (with strong chitinizations absent or in neck only) ---------- 4
4. Area immediately back of genital opening unpigmented and weakly chitinized ---------- 5
Area immediately back of genital opening darkly pigmented and strongly chitinized ---------- 9
5. On each side of genital opening, a saucer-like chitinized depression the posterior edge of which is raised into a roughened ridge.
{saccharalis (Fabricius) (p. 11)
{pallidostricta Dyar (p. 16)
{tabernella Dyar (p. 15)
{incomparella Dyar and Heinrich (p. 13)
{angustella Dyar (p. 17)
Area on each side of genital opening flattened or, if slightly depressed, without the raised posterior ridge ---------- 6

6. Bursa narrow, greatly elongated ---------- **magnifactella** Dyar (p. 14)
   Bursa broad, at least one-half times as broad as long ---------- 7
7. Bursa with a strongly chitinized ring in neck.
   indigenella Dyar and Heinrich (p. 13)
   Bursa without such ---------- 8
8. Shield projecting below genital opening, large.
   busckella Dyar and Heinrich (p. 16)
   Shield somewhat reduced ---------- { **continens** Dyar (p. 15); **instructella** Dyar (p. 10); **moorella** Dyar and Heinrich (p. 17); **pedibarbata** Dyar (p. 12) }
9. Genital opening with a slight scalloped ridge beneath; ductus extremely short (neck of bursa closely approximate to genital opening) ---------- 10
   Genital opening with a semitubular shield formed by external production of ductus; ductus longer (neck of bursa appreciably separated from genital opening) ---------- 11
10. Chitinization back of genital opening extending to eighth segment collar.
   grandiosella Dyar (p. 25)
   Chitinization back of genital opening not extending to eighth segment collar.
   { **lineolata** (Walker) (p. 24); **muellerella** Dyar and Heinrich (p. 25) }
11. Chitinization back of genital opening smooth; ductus narrow throughout length ---------- **cayennella** Dyar and Heinrich (p. 27)
   Chitinization back of genital opening corrugated; ductus greatly broadened toward bursa ---------- **bellifactella** Dyar (p. 26)
12. Genital opening with a thin broken ring about its mouth or with lateral edges of mouth slightly raised and chitinized ---------- 13
   Genital opening simple ---------- 14
13. Bursa greatly elongated, narrow ---------- { **maronialis** Schaus (p. 23); **umbrialis** Schaus (p. 23) }
   Bursa not greatly elongated, broad { **canella** Hampson (p. 20); **anathericola** Dyar and Heinrich (p. 21) }
14. Ductus strongly chitinized ---------- 15
   Ductus weakly chitinized ---------- 16
15. Bursa with slight signum ---------- **amnemonella** Dyar (p. 21)
   Bursa without signum ---------- **fuscella** Schaus (p. 22)
16. A very slight chitinization in neck of bursa ---------- { **evanescens** Dyar (p. 18); **gaga** Dyar (p. 18) }
   A strongly chitinized plate or collar in neck of bursa ---------- 17
17. Collar in neck of bursa partially scobinate ---------- **zeacolella** Dyar (p. 19)
   Collar in neck of bursa entirely smooth ---------- **venosalis** (Dyar) (p. 22)

DIATRAEA INSTRUCTELLA Dyar

Figure 49

Diatraea instructella DYAR, Ent. News, vol. 22, 1911, p. 201.

A large species. The fore wing light yellowish straw; cross lines well contrasted, the outer dotted, the inner continuous and irregularly wavy; discal dot distinct. The front is but gently convex, without tubercle.

Expanse.—Female, 44 mm.

Female genitalia with a shallow very slightly chitinized depression on each side of genital opening, forming a slight shield in front of genital opening. Figured from type.

No male is before us, only the single female type being known.

The life history is unknown.

Type.—In National Collection.

Type locality.—Popocatepetl Park, Mexico (8–10,000 feet).

DIATRAEA SACCHARALIS (Fabricius)

Figures 1, 2, 54

Phalaena saccharalis FABRICIUS, Ent. Syst., vol. 3, pt. 2, 1799, p. 238.
Chilo obliteratellus ZELLER, Mon. Chil. et Cramb., 1863, p. 8.
Crambus leucantellus WALKER, Cat. Lepid. Heter. Brit. Mus., pt. 27, 1863, p. 161.
Crambus lineosellus WALKER, Cat. Lepid. Heter. Brit. Mus., pt. 27, 1863, p. 162.
Chilo comparellus FELDER, Reise Novara, Lepid., 1874, pl. 137, fig. 5.
Chilo crambidoides GROTE, Can. Ent., vol. 12, 1880, p. 15.
Diatraea saccharalis (Fabricius) HAMPSON, Proc. Zool. Soc. London, 1895, p. 953.—FERNALD, in Dyar List, Bull. 52, U. S. Nat. Mus., No. 4624, 1903.—BARNES and McDUNNOUGH, List Lepid. Bor. Amer., No. 5436, 1917.—FORBES, Journ. New York Ent. Soc., vol. 28, 1920, p. 224.
Diatraea saccharalis grenadensis DYAR, Ent. News, vol. 22, 1911, p. 200.
Diatraea pedidocta DYAR, Ent. News, vol. 22, 1911, p. 201.
Diatraea saccharalis crambidoides (Grote) HOLLOWAY, Journ. Agr. Res., vol. 6, 1916, p. 621.—HOLLOWAY and LOFTIN, U. S. Dept. Agr., Bul. No. 746, 1919 (Bibliography).

Size variable. Forewing yellowish brown, frequently more brown than yellow, especially in the male; lines generally distinct in both sexes, the outer dotted, the inner bent, parallel; discal dot and terminal dots blackish. Hind wing sordid brownish in the male, white in the female. Front gently bulging, without tubercle. Hind tibia of male with a slight whitish tuft of hairs.

Expanse.—Male, 18–28 mm.; female, 27–39 mm.

Male genitalia with lateral lobes rising from above base of tegumen; lobes broad and rounded (nearly as broad as long). Harpe with a densely scobinate knoblike projection from base of costa. Uncus with apex pointed. Gnathos strongly spined for half its length from apex. Lateral arms of anellus with a few faint scattered scobinations near their apices, otherwise simple; moderately long. Penis with a single strong cornutus. Figured from reared specimen from Baton Rouge, La.

Female genitalia with a saucerlike chitinous depression on each side of genital opening, roughened above and fusing beneath to form a centrally and irregularly excavate shield in front of genital opening. Ductus bursae broad and chitinized. Bursa moderately

large, about as broad as long. Figured from reared specimen from Audubon Park, La.

Abdomen of male with a pair of hair tufts on second segment.

Well distributed throughout tropical America from the Gulf coast of United States to Mexico and Argentina, including the Antilles. We are unable to distinguish any racial forms. The above synonymy is taken from Hampson in respect to the Walker, Zeller, and Felder species. This is a well-known enemy of the sugar cane in the larval stage.

The Holloway and Loftin bulletin, cited above, gives a complete account of the insect, with figures and detailed descriptions. In that paper there is an error in the larval description and the figures (pl. 4) of the head capsule of *saccharalis* and *zeacolella* for which the present junior author (Heinrich) is responsible, and which we would correct here. The frontal punctures on the epicranium are described as "well separated; distance between punctures considerably greater than distance from puncture (F^a) to frontal seta (F^1)"; and the figures of the head capsules of both *saccharalis* and *zeacolella* show them so. In reality the punctures lie very close together and immediately between the frontal setae in all species of *Diatraea*.

Chilo crambidoides Grote, which we retain here as a synonym, will doubtless prove to be actually an earlier name for *Diatraea zeacolella* Dyar. However, we have not examined the type.

Types.— ——— (*saccharalis*); Vienna Museum (*obliteratellus*); British Museum (*leucaniellus*, *lineosellus*); Tring Museum (*comparellus*); National Collection (*pedidocta*); ——— (*crambidoides*).

Type localities.—"Americae meridionalis" (*saccharalis*); Brazil (*obliteratellus*); San Domingo (*leucaniellus*); Honduras (*lineosellus*); Bogota, Colombia (*comparellus*); Kansas (*crambidoides*); Cordoba, Mexico (*pedidocta*).

Food plants.—Sugar cane, corn, broom corn, Kafir corn, Milo maize, Sorghum (*Sorghum halepense*), Soudan grass (*Andropogon sorghum soudanensis*), Para grass, vitiver (*Andropogon muricatus*), feather grass (*Lectochloa mucronota*), rice (?).

DIATRAEA PEDIBARBATA Dyar

Figure 4

Diatraea pedibarbata DYAR, Ent. News, vol. 22, 1911, p. 202.

A medium-sized species. Fore wing brownish straw, rather darkly shaded; veins faintly lined in brown; transverse lines dotted as in allies, the inner subcontinuous; discal dot small. Hind wings in male lightly dusky shaded. Front bulging, smooth, without tubercle. Hind tibia in male with a large blackish brown shaded hair tuft.

Expanse.—Male, 22–24 mm.

Male genitalia with lateral lobes of tegumen triangular and bluntly pointed. Basal projection from costa of harpe, large, irregular, roughened, but not scobinate or dentate. Gnathos spined for half its length from apex. Arms of anellus smooth.

Female genitalia similar to those of *instructella*, except that bursa is longer.

Two males only before us, the type and one other specimen, the latter from Platation Skeldon, British Guiana, October, 1914 (H. W. B. Moore). Also five females, doubtless referable here, from French Guiana (Dognin Collection).

Mr. Moore's specimen was bred from a larva in sedge. We have no further data on the life history.

Type.—In National Collection.

Type locality.—St. Laurent, Maroni River, French Guiana.

Food plant.—*Cyperus* species.

DIATRAEA INDIGENELLA, new species

Figure 51

Similar in general appearance to *fuscella;* larger; lighter in color, brownish straw; the markings narrower and less contrasted. Hind wings in the female, brown. Front with a pointed tubercle.

Expanse.—Female, 25–38 mm.

Female genitalia similar to those of *continens* and *instructella;* distinguished by the strong chitinous ring about the neck of bursa.

Described from female type and four female paratypes, all from the type locality, 1895 and 1897 (Dognin Collection).

The life history is unknown.

Type.—Cat. No. 29,426, U.S.N.M.

Type locality.—Popayán, Colombia.

DIATRAEA INCOMPARELLA, new species

A medium-sized species similar to *rufinella*, but with the fore wing of a bright yellowish brown straw; veins faintly dark lined; discal dot small or absent; small terminal black dots between the veins. Hind wing white (female). No males are before us, but it is probable that the wing markings are more distinct, and possibly there is a hair tuft on the hind tibia. Front strongly bulging, though without tubercle.

Expanse.—Female, 26–31 mm.

Female genitalia as in *saccharalis.*

Seven females are before us, three from Taperinha, Amazons, Brazil, and four from Rio Maderia, Amazons, July–August (Fassl), from the Schaus and Dognin Collections.

Life history unknown.

Type.—Cat. No. 29,427, U.S.N.M.

Type locality.—Taperinha, Amazons, Brazil.

DIATRAEA MAGNIFACTELLA Dyar

Figures 3, 52

Diatraea magnifactella DYAR, Ent. News, vol. 22, 1911, p. 201.

A large species. Fore wing brownish straw, darker in the male than in the female; cross lines distinct in the male, less so in the female, blackish like the terminal and discal dots, the outer line dotted. Hind wing brown in the male, largely sordid-tinted in the female. Front with a tubercle. Hind tibia of the male without hair tuft.

Expanse.—Male 32 mm.; female, 36–47 mm.

Male genitalia distinguished by the truncate (almost square) lateral lobes of tegumen and the irregularly shaped and spined projection from costal base of harpe. Arms of anellus finely scobinate at apices. Gnathos finely spined for about half its length from apex. Figured from paratype from Orizaba.

Female genitalia distinguished by the coarse granulation in area behind genital opening and the greatly elongated bursa. Figured from paratype from Oaxaca.

Two males, eight females before us from Mexico; Villa Union, Sinaloa, Cuernavaca, Jalapa, Orizaba, Oaxaca (the Villa Union specimens reared by T. E. Holloway).

Type.—In National Collection.

Type locality.—Orizaba, Mexico.

Food plant.—Sugar cane.

DIATRAEA GUATEMALELLA Schaus

Figures 6, 55

Diatraea guatemalella SCHAUS, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 138.

Resembling *tabernella*, but somewhat larger, the hind tibia of the male without hair tuft. Lines as in *tabernella*, but the inner accompanied centrally by a shaded blotch, which shows, more or less, even in the female. Male fore wing brownish straw; of female more yellowish; the lines faint but not wholly obliterated. Hind wing of male strongly and uniformly brown shaded; of female white. The front is produced with central tubercle.

Expanse.—Male, 21–30 mm; female, 30–40 mm.

Male genitalia distinguished by the coarse and dense dentation of the basal costal projection of harpe, the triangular, sharply pointed lateral lobes of tegumen, and the almost smooth gnathos (spined only very weakly toward apex).

Female genitalia distinguished by the very wide genital opening; bursa greatly elongated.

Abdomen of male with pair of lateral hair tufts on second segment.

Genitalia figured from specimens from the type locality.

Eleven males and 13 females before us, from various localities in Guatemala, the majority from Cayuga (Schaus and Barnes).

The life history unknown.

Type.—In National Collection.

Type locality.—Cayuga, Guatemala.

DIATRAEA TABERNELLA Dyar

Figure 7

Diatraea saccharalis tabernella DYAR, Ent. News, vol. 22, 1911, p. 200.

A medium-sized species, variable in size. Fore wing brownish straw color; the veins not lined; two outer lines oblique, parallel, dotted; discal dot small, black. In the male the lines are distinct, the hind wing tinged with brownish. In the female the lines are faint or obliterate, the ground color lighter, more yellowish, while the hind wings are white. In the male the hind tibia has a large tuft of erect, curving, blackish hairs. The front of the head is conically produced with a central tubercle.

Expanse.—Male, 18–28 mm.; female, 25–39 mm.

Male genitalia similar to those of *saccharalis* except: Lateral lobes of tegumen narrower (much longer than broad); basal costal projection of harpe differently shaped; gnathos spines weaker and extending for only about a third its length from apex. Figured from type.

Female genitalia as in *saccharalis.*

Abdomen of male with a pair of lateral tufts on second segment.

Twenty-nine males and 16 females are before us, mostly from various localities in Panama; three of the females from Sixola River and Juan Vinas, Costa Rica, from Doctor Schaus's collecting; one male is from Nicaragua without further data.

The life history is unknown.

Type.—In National Collection.

Type locality.—Tabernilla, Canal Zone, Panama.

DIATRAEA CONTINENS Dyar

Figure 50

Diatraea continens DYAR, Ent. News, vol. 22, 1911, p. 202.

Fore wing light ocher, the veins narrowly dark lined; transverse lines parallel, shaded and continuous, ending in a dark oblique brown apical shade; terminal dots small, round; discal dot slight. Hind

wing white (female). The front is nearly flat, but has a central tubercle.

Expanse.—Female, 29 mm.

Female genitalia as in *instructella* but somewhat more strongly chitinized in front of genital opening.

Only the single female type is before us.

The life history is unknown.

Type.—In National Collection.

Type locality.—Castro, Parana, Brazil.

DIATRAEA PALLIDOSTRICTA Dyar

Diatraea pallidostricta DYAR, Ent. News, vol. 22, 1911, p. 205.

Fore wing pale yellowish straw color, the veins lined in brown; a distinct ray through cell and beyond; terminal dots absent; discal dot very small, brown. Hind wing white, a little dusky apically.

Expanse.—Female, 38 mm.

Genitalia as in *saccharalis*.

Only the single female type is before us.

The life history is unknown.

Type.—In National Collection.

Type locality.—São Paulo, Brazil.

DIATRAEA BUSCKELLA, new species

Figures 5, 53

A medium-sized species. Fore wing light yellowish straw color, paler in the female than in the male; veins conspicuously lined in brown, the linings on median vein and vein 1 heavier than the others; in the male fainter lines also between the veins; discal dot round, blackish; terminal intervenular dots small, distinct; beyond the cell a clearer ray above vein 5. Hind wing white in both sexes. Male hind tibia with a large blackish tuft which reaches the end of the joint. Front conical, with a small tubercle.

Expanse.—Male, 25 mm.; female, 32 mm.

Male genitalia with lateral lobes of tegumen subtriangular, bluntly pointed, in shape between those of *gautemalella* and *tabernella*. Projecting lobe from base of costa of harpe coarsely spined. Gnathos spined for a little less than half its length from apex. Arms of anellus scobinate toward apices. Cornutus weak. Figured from type.

Female genitalia similar to those of *magnifactella*, but with heavier shield below (in front of) genital opening, and with shorter broader bursa. Figured from paratype.

Abdomen of male with a pair of lateral hair tufts on second segment.

Male type and female paratype before us from the type locality, April 17–24, 1912 (A. Busck).

The life history is unknown.

Type.—Cat. No. 29428, U.S.N.M.

Type locality.—Porto Bello, Panama.

DIATRAEA ANGUSTELLA Dyar

Figures 8, 56

Diatraea angustella DYAR, Ent. News, vol. 22, 1911, p. 205.

Fore wing narrow and dull dark brownish, the veins conspicuously lined; discal dot small or obsolete; a distinct yellow ray from the cell outward. Hind wing slightly brownish tinged in male, white in female.

Expanse.—Male, 29 mm.; female, 32–35 mm.

Male genitalia with broadly triangular lateral lobes on tegumen. Basal costal projection of harpe rather finely scobinate. Gnathos spined for over one-third its length from apex.

Female genitalia as in *saccharalis*, except ductus and area about genital opening less strongly chitinized.

Abdomen of male with a pair of lateral tufts on second segment.

Two males and five females before us, all from the type locality.

The life history is unknown.

Type.—In National Collection.

Type locality.—Castro, Parana, Brazil.

DIATRAEA MOORELLA, new species

Very similar to *angustella;* smaller, the ground of fore wing more yellowish, the discal dot generally more distinct. Front with a tubercle. Hind tibia without hair tuft.

Expanse.—Male, 20–26 mm.; female, 28–30 mm.

Male genitalia like those of *angustella.*

Female genitalia as in *instructella.*

Abdomen of male with a pair of lateral tufts on second segment.

Three males and six females before us, British Guiana and Brazil: Estate "Die Kinderen," British Guiana (H. W. B. Moore, No. 111); "All Estates," British Guiana (H. W. B. Moore, No. 81); Castro, Parana, Brazil.

Mr. Moore's No. 111 was bred from larva in stem of *Antherum bicorne* (=*Andropogon*); his No. 81 from larva in stems of razor grass (*Paspalum* species). Both sexes of No. 81 are before us, but of No. 111 we have only a male, the genitalia of which are here less distinct than usual.

Compare also *anathericola*, bred from the former food plant, but a gray, not yellowish, species.

Type.—Cat. No. 29429, U.S.N.M.

Type locality.—Georgetown, British Guiana.

Food plants.—*Andropogon*, *Paspalum*.

DIATRAEA GAGA Dyar

Figure 9

Diatraea gaga DYAR, Proc. U. S. Nat. Mus., vol. 47, 1914, p. 319.
Diatraea solipsa DYAR, Proc. U. S. Nat. Mus., vol. 47, 1914, p. 319.

A small species resembling an *Iesta*. Fore wing light pale straw color, a yellowish ray beyond the cell; discal and terminal dots rather large, blackish; veins strongly lined in brown, but narrowly and without contrast; cross line distinct, strigose, not dotted, roundedly confluent below costa. Hind wing a little touched with brown at apex in male; white in female.

Expanse.—Male 13–18 mm.; female 16–18 mm.

Male genitalia with tegumen simple (without lateral lobes). Costa of harpe simple. Gnathos slender, with only the faintest trace of spines near apex. Arms of anellus smooth. Cornutus absent. Figured from type.

Female genitalia as in *evanescens* except for somewhat smaller bursa.

Abdomen of male with pair of lateral hair tufts on second segment.

Seventeen males and 12 females before us from various localities in Panama.

The life history is unknown.

Types.—In National Collection.

Type localities.—Corozal, Panama (*gaga*); Porto Bello, Panama (*solipsa*).

DIATRAEA EVANESCENS Dyar

Figs. 10, 57

Diatraea evanescens DYAR, Ins. Ins. Mens., vol. 5, 1917, p. 84.—FORBES, Journ. New York Ent. Soc., vol. 28, 1920, p. 224.
Diatraea sobrinalis SCHAUS, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 140.

A species generally below medium size, sometimes small. Fore wing dull dark wood brown, the veins distinctly darker; a rounded discal dot, but no cross lines. Hind wing in the male almost as light as in the female, a little brownish shaded apically. Front without a tubercle. Hind tibia in the male without a tuft.

Expanse.—Male, 11–20 mm.; female, 21–30 mm.

Male genitalia with lateral lobes of tegumen arising from its extreme base, narrow, rounded. Costa of harpe simple. Arms of anellus smooth. Cornutus not distinguishable. Figured from specimen from Audubon Park, La.

Abdomen of male with pair of lateral tufts on second segment.

Specimens are before us from Louisiana and Mississippi, and a series of four males and four females from Cayuga, Guatemala, the latter running larger than those from the Gulf coast.

Louisiana specimens were bred from *Paspalum*.

Types.—In National Collection.

Type localities.—Audubon Park, La. (*evanescens*); Cayuga, Guatemala (*sobrinalis*).

Food plant.—*Paspalum larranagae.*

DIATRAEA ZEACOLELLA Dyar

Figures 11, 59

Diatraea zeacolella DYAR, Ent. News, vol. 22, 1911, p. 203.—HOLLOWAY, Jour. Agr. Res., vol. 6, 1916, p. 624.—BARNES and McDUNNOUGH, List Lepid. Bor. Amer. No. 5437, 1917.—HOLLOWAY and LOFTIN, U. S. Dept. Agr., Bull. No. 746, 1919.—FORBES, Mem. 68, Cornell Univ. Agr. Exp. Sta., 1923, p. 591.

Diatraea tripsasicola DYAR, Ins. Ins. Mens., vol. 9, 1921, p. 193.

A medium to large sized species, resembling *saccharalis.* The species can generally be distinguished by its larger size, and the faint subterminal line on the hind wings of the male.

Expanse.—Male, 26–36 mm.; female, 29–42 mm.

Male genitalia resembling those of *postlineella*, but differing markedly in the shape of the uncus (compare, figs. 11, 12). Harpe very broad at base, otherwise simple. Uncus heavy, with lateral flaps and a broadened apex. Gnathos very stout, hooked and strongly spined. Annellus with arms short, pointed and smooth. Penis without cornutus. Figured from reared specimen from Richmond, Virginia (Webster No. 13146).

Female genitalia with no extra chitinization in area surrounding genital opening. Ductus bursae rather weakly chitinized. Bursa large with a broad semicircular, partially scobinate collar in neck. Figured from paratype from Tryon, N. C.

Abdomen of male with a pair of lateral hair tufts on second segment.

The larvae are fully described in the Holloway and Loftin bulletin cited above. Here also we would note the same correction to the description as in *saccharalis* (see p. 12).

Specimens are before us from the Southern States, Virginia, North Carolina, and Florida, also recently a specimen from Kansas.

Types.—In National Collection.

Type localities.—Tryon, N. C. (*zeacolella*); Miami, Fla. (*tripsacicola*).

Food plants.—Indian corn, *Tripsacum* (larvae boring in the stems).

It is probable that *Chilo crambidoides* Grote, referred to the synonymy of *sacharalis*, is an earlier name for this species. *C. crambi-*

doides was described from Kansas, whence we have received a specimen of *zeacolella*, but we have never seen *saccharalis* from north of the Gulf coast region.

DIATRAEA POSTLINEELLA Schaus

Figure 12

Diatraea postlineella SCHAUS, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 138.

A rather large, darkly shaded species, known in only the single male type. Fore wing dark brown, the lines and discal dot darker, not strongly contrasted. Hind wing almost as dark as fore wing, showing near the margin a shaded darker band. Front prominently bulging, but without tubercle. Hind tibia of male without tuft.

Expanse.—Male, 27 mm.

Male genitalia as in *zeacolella*, but with uncus bluntly pointed and without lateral flaps. Figured from type.

Abdomen of male with pair of lateral tufts on second segment.

The life history is unknown.

Type.—In National Collection.

Type locality.—Quirigua, Guatemala.

DIATRAEA CANELLA Hampson

Figures 13, 60

Diatraea canella HAMPSON, Ann. Mag. Nat. Hist., ser. 6, vol. 16, 1895, p. 349.

A readily recognizable species, broad winged, reddish gray, the cross lines distinct, outer one dotted, inner excurved around the discal dot; sparsely black irrorate. Hind wings soiled white in the male, sometimes soiled slightly apically in the female. Front with a conical tubercle. Hind tibia of the male without hair tuft.

Expanse.—Male, 19–30 mm.; female, 25–34 mm.

Male genitalia with a slender subbasal digitate projection (three times as long as broad) from costa of harpe. Anellus with a few serrate projections on lateral edges and with long, slender, pointed, smooth lateral arms. Penis with a single short pointed cornutus. Figured from specimen from Georgetown, British Guiana.

Female genitalia distinguished by the irregular shape of the genital opening and the small chitinous patch in the neck of bursa. Figured from specimen from British Guiana (G. E. Bodkin.)

Abdomen of male without hair tufts on second segment.

From the Guianas, Trinidad, and Grenada.

Type.—In British Museum.

Type locality.—Grenada.

Food plant.—Sugar cane (larvae boring in the stems).

DIATRAEA ANATHERICOLA, new species

Fore wing gray, irrorate on a whitish ground, a whitish streak beyond the cell; veins obscurely lined in brown, yet contrasting; a whitish ray beyond cell, beneath which and median vein is a brown shading; discal and terminal dots small, blackish. Hind wing white in both sexes. Front with a pointed tubercle. Hind tibia of the male hairy, pale.

Expanse.—Male, 32 mm.; female (dwarfed), 25–30 mm.

Genitalia (male and female) as in *canella.*

Abdomen of male without tufts on second segment.

Male, São Paulo, Brazil (Schaus Collection); two females, Die Kinderen Plantation, British Guiana (H. W. B. Moore).

The British Guiana specimens were bred from larvae in the stems of *Anatherum bicorne* (=*Andropogon*), according to Mr. Moore's determination. Compare *moorella*, bred from the same plant, but a yellowish, not a gray species.

Type.—Cat. No. 29,430, U.S.N.M.

Type locality.—São Paulo, Brazil.

DIATRAEA AMNEMONELLA Dyar

Figures 14, 62

Diatraea amnemonella DYAR, Ent. News, vol. 22, 1911, p. 203.

Fore wing narrow. Hind wing emarginate discally. Fore wing reddish gray, sparsely black irrorate, forming traces of cross lines. Hind wing white, a little touched with dusky shading apically in the male. Front with a tubercle. Hind tibia of male without hair tuft.

Expanse.—29 mm., both sexes.

Male genitalia similar to those of *canella* except with shorter digitate subbasal projection from costa of harpe (less than twice as long as broad). Figured from type.

Female genitalia with small scobinate signum in bursa and a pair of chitinized ridges in neck of bursa. Otherwise as in *canella.* Figured from paratype.

Abdomen of male without hair tufts on second segment.

Only the male and female types from the type locality are before us.

The life history is unknown.

Type.—In National Collection.

Type locality.—Castro, Parana, Brazil.

DIATRAEA FUSCELLA Schaus

Figures 15, 61

Diatraea fuscella Schaus, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 139.

Similar to *bellifactella*, distinctly darker, with broad intervenular streaks; cross lines indicated by discolorous blackish dots on the veins, of the same color as the discal and terminal dots. Hind wing brown, about as dark in the female as in the male. Front with a pointed conical tubercle. Hind tibia of the male without hair tuft.

Expanse.—Male, 23 mm.; female, 23–32 mm.

Male genitalia with tegumen greatly developed, semitubular. Uncus and gnathos very stout and broad toward their extremities. Harpe with a slight, strongly haired hump at base of costa, otherwise simple and much as in *zeacolella* and *postlineella*. Anellus with lateral arms moderately long and smooth. Penis without distinguishable cornutus. Figured from type.

Female genitalia resembling those of *canella*, but with an unwrinkled genital opening and with a slightly different chitinization in the neck of the bursa. Figured from specimen from Chejel, Guatemala.

Abdomen of male with a pair of lateral hair tufts on second segment.

Easily distinguished by the peculiarly shaped tegumen, uncus, and gnathos of the male genitalia.

One male and three females before us: Carillo and Guapiles, Costa Rica; Chejel, Guatemala.

The life history is unknown.

Type.—In National Collection.

Type locality.—Carillo, Costa Rica.

DIATRAEA VENOSALIS (Dyar)

Figures 16, 58

Haimbachia venosalis Dyar, Ins. Ins. Mens., vol. 5, 1917, p. 87.

Diatraea (?) *venosalis* Forbes, Journ. New York Ent. Soc., vol. 28, 1920, p. 221.

A very small species, distinctly marked. Ground of fore wing whitish; veins and interlines more faintly brown; discal dot large; brown terminal dots small. Hind wing white in both sexes. Front without a tubercle. Hind tibia of the male without a hair tuft.

Expanse.—Male, 15–19 mm.; female, 21 mm.

Genitalia similar to those of *gaga*, distinguished only by the somewhat stronger spining on gnathos of male and a slightly heavier chitinization at the juncture of ductus and bursa (in female).

Abdomen of male with pair of lateral hair tufts on second segment.

Four males and one female before us, all from the type locality.

The life history is unknown.

Type.—In National Collection.

Type locality.—Audubon Park, La.

DIATRAEA MARONIALIS Schaus

Figures 17, 64

Diatraea maronialis Schaus, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 139.

Ground color of fore wing light straw yellow; discal and terminal dots distinct, blackish; median area broadly shaded with brown, limited by the outwardly placed outer line, which reaches the margin above vein 5, leaving the tornal area broadly clear. Hind wing soiled whitish in the male, somewhat soiled also in the female. Front with a sharp-pointed tubercle. Hind tibia of the male without hair tuft.

Expanse.—Male, 20–25 mm.; female, 26–31 mm.

Male genitalia distinguished by their extremely slender uncus and gnathos, the abruptly pointed, smooth arms of anellus, and the slight smooth projection from costal base of harpe. Figured from type.

Female genitalia distinguished by the slight chitinous ring about the genital opening. Figured from specimen from the type locality.

Abdomen of male with pair of lateral hair tufts on second segment.

Two males and three females are before us: St. Jean and Cayenne, French Guiana; Rio Tapajoz, Amazons, Brazil (Dognin Collection).

The life history is unknown.

Type.—In National Collection.

Type locality.—St. Jean, Maroni River, French Guiana.

DIATRAEA UMBRIALIS Schaus

Diatraea umbrialis Schaus, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 139.

Fore wing whitish straw, all the veins and intervenules lined with concolorous brown; no discal or terminal dots or other discolorous markings; outer line a broad ill-defined shade from before tornus to apex. Hind wing whitish, soiled at apex in female. Front with a sharp-pointed tubercle.

Expanse.—Female, 25–29 mm.

Female genitalia as in *maronialis.*

Two females are before us, St. Jean and St. Laurent, French Guiana.

The life history is unknown.

Type.—In National Collection.

Type locality.—St. Jean, Maroni River, French Guiana.

DIATRAEA LINEOLATA (Walker)

Figures 18, 63

Leucania lineolata WALKER, Cat. Lepid. Heter. Brit. Mus., pt. 9, 1856, p. 100.

Crambus impersonatellus WALKER, Cat. Lepid. Heter. Brit. Mus., pt. 27, 1863, p. 163.

Chilo culmicolellus ZELLER, Mon. Chil. et Cramb., 1863, p. 7.

Chilo neuricellus ZELLER, Mon. Chil. et Cramb., 1863, p. 8.

Diatraea lineolata (Walker) HAMPSON, Proc. Zool. Soc. London, 1895, p. 953.

A medium sized to large species, variable in size. Fore wing ground color light straw yellow; veins lined with brown, the interlines absent or faint and ill-defined; discal dot variable in size and distinctness, it and the terminal dots brown, concolorous with the vein linings. Hind wing soiled white in the male, white in the female. Front with a pointed tubercle. Hind tibia of male without hair tuft.

Expanse.—Male, 20–31 mm.; female, 26–40 mm.

Male genitalia at once distinguished by the broadened, double-pointed apices of the long lateral arms of anellus, and the greatly lengthened, pointed uncus and gnathos. Figured from specimen from Purulha, Guatemala.

Female genitalia with ductus greatly reduced (the neck of the bursa coming almost to genital opening). The area behind and caudad of genital opening smooth and rather strongly chitinized. A dark, narrow, heavily chitinized, semicircular band in neck of bursa. Bursa greatly elongated. Figured from specimen from Avangarez, Costa Rica.

Abdomen of male without hair tufts on second segment.

Specimens are before us from Mexico, Costa Rica, Guatemala, Panama, Colombia, the Guianas, Cuba, and the Bahamas.

Types.—In British Museum (*lineolata*, *impersonatellus*, *neuricellus?*); "Mus. Berol." (*culmicolellus*).

Type localities.—Venezuela (*lineolata*, *impersonatellus*, *neuricellus*); Colombia (*culmicolellus*).

Food plant.—Corn (larvae in the stalks and cobs).

DIATRAEA SCHAUSELLA, new species

Figure 19

A species similar to *lineolata*, distinguished by the intensification of the markings, and the black (not concolorous-brown) discal and terminal dots. Fore wing yellowish straw color, the veins brown-lined somewhat irregularly, being streaked on inner margin and between veins 4 and 5. Hind wing soiled whitish, rather distinctly

dark tinted. Front with a pointed tubercle. Hind tibia of male without a hair tuft.

Expanse.—Male, 28–31 mm.

Male genitalia as in *grandiosella* except: Uncus bluntly pointed; gnathos rather short (considerably shorter than uncus), terminating in a scobinate bluntly rounded end with a short, sharp spur beneath; cornutus weakly chitinized but distinguishable.

Abdomen of male without tufts on second segment.

Two males are before us from the type locality, dated August (Schaus and Barnes).

The life history is unknown.

Type.—Cat. No. 29431, U.S.N.M.

Type locality.—Chejel, Guatemala.

DIATRAEA MUELLERELLA, new species

Figure 20

Superficially indistinguishable from *lineolata* Walker. Separable on details of the genitalia.

Expanse.—Male, 28 mm.; female, 30 mm.

Male genitalia as in *grandiosella* except that gnathos has a strong, projecting inner spur before apex. Figured from type.

Female genitalia as in *lineolata* except that chitinous band in neck of bursa is a trifle stouter.

Abdomen of male without tufts on second segment.

A male and a female are before us: Male, Guerrero, Mexico, July, 1920 (R. Müller); female, Iguala, Guerrero, Mexico, June, 1906 (W. Schaus).

The life history is unknown.

Type.—Cat. No. 29432, U.S.N.M.

Type locality.—Guerrero, Mexico.

DIATRAEA GRANDIOSELLA Dyar

Figures 21, 68

Diatraea grandiosella DYAR, Ent. News, vol. 22, 1911, p. 205.

Diatraea lineolata BARNES and MCDUNNOUGH (not Walker), List Lepid. Bor. Amer., No. 5438, 1917.

A rather large, light colored species. Fore wing pale, whitish, with slight yellow tint; veins and intervenular lines brown; discal and terminal dots small, blackish. Front without a tubercle. Male hind tibia without a tuft.

Expanse.—Male, 15–30 mm.; female, 30–38 mm.

Male genitalia with harpe simple except for a slight hairy protuberance from base of costa. Uncus and gnathos broadened (spatu-

late) at their tips. Anellus with long, slender, lateral arms, each with a short subapical spur (a type of anellus reproduced in *muellerella* and *schausella*). Penis without cornutus. Figured from specimen from Colima, Mexico.

Female genitalia of the *lineolata* type. With ductus bursae extremely short. Area behind genital opening chitinized, this chitinization continuing in a narrow somewhat wrinkled band almost to ovipositor. A heavily chitinized semicircular band in neck of bursa. Figured from type.

Abdomen of male without hair tufts on second segment.

From southwestern Texas, southern New Mexico, and Arizona to Mexico—Los Mochis and Venadio, Sinaloa; Colima, Guadalajara, Tehuacan.

Superficially resembles *lineolata* Walker, but the front is without a tubercle.

Type.—In National Collection.

Type locality.—Guadalajara, Mexico.

Food plant.—Corn (larvae boring in the stalks and roots).

DIATRAEA BELLIFACTELLA Dyar

Figures 22, 67

Diatraea bellifactella DYAR, Ent. News, vol. 22, 1911, p. 205.

A rather large species near *lineolata* and *schausella*, but showing indications of the transverse lines by thickening of the vein linings. Discal and terminal dots discolorous with the vein linings. Front with a conical tubercle. Hind tibia of male without a hair tuft.

Expanse.—Male, 28 mm.; female, 32 mm.

Male genitalia with two projections from costa of harpe, a haired, subbasal one and a small sparsely spined basal knob. Uncus broad and bilobed. Gnathos proportionately broadened, unspined. Anellus with a smooth, pointed, central projection, and with slender, pointed, smooth rather long lateral arms. Cornutus an irregular chitinization on surface of penis. Figured from type.

Female genitalia with ductus short, strongly chitinized, and broadening markedly toward bursa. Bursa greatly elongated, with a semicircular chitinous band in neck. Genital opening with a protruding semitubular, strongly chitinized mouth. Area behind and for a short distance caudad of genital opening corrugated and strongly chitinized. Figured from paratype from Castro, Parana, Brazil.

Abdomen of male with a pair of lateral hair tufts on second segment.

Easily recognized from its characteristic genitalia.

From Brazil, São Paulo and Castro; only the male and female types before us.

Life history is unknown.

Type.—In National Collection.

Type locality.—São Paulo, Brazil.

DIATRAEA STRIGIPENNELLA Dyar

Figures 23, 66

Diatraea strigipennella DYAR, Ent. News, vol. 22, 1911, p. 206.

Indistinguishable in coloration or frontal structure from *anathericola;* separable on details of the genitalia.

Expanse.—Male, 27 mm.; female, 25–28 mm.

Male genitalia with a strongly chitinized, subbasal, somewhat roughened and serrate projection from costa of harpe. Uncus and gnathos pointed. Anellus with a bluntly pointed, finely spined, central projection and long slender, lateral arms, the latter finely serrate toward their extremities. Cornutus a heavy bush of coarse serrations, about two-thirds as long as aedoeagus.

Female genitalia with ductus moderately long, strongly chitinized, broadening toward genital opening and produced beneath into a shield before genital opening. Area behind genital opening unpigmented and smooth. Bursa of moderate size with half one side toward ductus strongly chitinized and wrinkled, and with an internal, median girdle of serrate ridges.

Abdomen of male without lateral tufts on second segment.

One male, four females before us, from the type locality (Schaus Collection).

The life history is unknown.

Type.—In National Collection.

Type locality.—Castro, Parana, Brazil.

DIATRAEA CAYENNELLA, new species

Figures 24, 65

Indistinguishable from *strigipennella* and *anathericola* in color and frontal structure. Separable by details of the genitalia.

Expanse.—Male, 26 mm.; female, 28 mm.

Male genitalia with two strongly chitinized projections from costa of harpe, an irregularly serrate, pointed subbasal one, and a broad flat, serrate, hooked, basal one. Uncus and gnathos pointed. Anellus with a smooth, pointed, central projection, and moderately long, tapering, sharply pointed, lateral arms, the latter rather strongly serrate toward their apices. Figured from type.

Female genitalia with ductus strongly chitinized, projecting beneath into a cleft shield. Area just behind genital opening, and cephelad of it on ventral surface, rather strongly chitinized and pigmented. Ductus of moderate size, with a complete and strongly chitinized ring in neck. Figured from paratype.

Abdomen of male without tufts on second segment.

A male and female are before us, both from the type locality, February, 1904 (W. Schaus).

The life history is unknown.

Type.—Cat. No. 29433, U.S.N.M.

Type locality.—Cayenne, French Guiana.

DIATRAEA CASTRENSIS, new species

Figure 25

Very similar to *amnemonella;* the color a little less brown, though still distinctly brown tinted. Separable on details of the genitalia.

Expanse.—Male, 26 mm.

Male genitalia similar to those of *cayenella* except that hooklike projection from extreme base of costa of harpe is smooth and narrower. The male abdomen also has a pair of lateral tufts on second segment. This species, *strigipennellus*, *cayenella*, and *bellifactella* all have a central projection from anellus; but each has quite distinctive genitalia otherwise.

Described from single male type (Schaus Collection).

Life history unknown.

Type.—Cat. No. 29434, U.S.N.M.

Type locality.—Castro, Parana, Brazil.

Genus HEMIPLATYTES Barnes and Benjamin

Hemiplatytes Barnes and Benjamin, Cont. Nat. Hist. Lepid. N. Amer., vol. 5, 1924, p. 192.

Front flat and smooth. No ocelli. Labial palpi porrect and downcurved, slender, extending three times the length of head. Maxillary palpi triangularly dilated with scales. Male antennae slightly thickened; female, filiform. Fore wing with vein 3 near angle of cell, which is rounded; 4 and 5 separate at origin; 6 below apex of cell; 7 at apex; 8–9 stalked from before apex; 10 approximate to the stalk of 8–9; 11 anastomosing with 12. Hind wing with 3 and 4 separate from angle of cell; 5 from much above the angle; the cross-vein between 4 and 5 retreating; 6 from apex of cell, shortly separated from the stalk of 7–8.

Male genitalia with vinculum narrowly and elongately triangular. Harpe undivided; irregularly and elongately triangular, broad at

base and abruptly narrowed at middle where costa is sharply emarginate to the apex; costa finely spined on basal half. Uncus moderately broad, with apex bluntly rounded; a somewhat broadened hook. Gnathos unspined. Anellus with produced lateral arms; juxta detached.

Female genitalia with ductus bursae unchitinized except slightly at genital opening. Bursa moderately sized; unchitinized; signum absent. Ovipositor and chitinous supporting rods normal.

Abdomen of male without lateral tufts on second segment.

Genotype.—*Diatraea epia* Dyar.

HEMIPLATYTES EPIA (Dyar)

Figures 30, 82

Diatraea epia DYAR, First Rep. Laguna Marine Lab., 1912, p. 165.

Chilo epia (Dyar) BARNES and MCDUNNOUGH, List Lepid. Bor. Amer., No. 5434, 1917.

Platytes damon BARNES and MCDUNNOUGH, Cont. Nat. Hist. Lepid. N. Amer., vol. 4, 1918, p. 172.

A small species, the male dark brown with nearly black hind wings; the female whitish with only a trace of the brown markings and whitish hind wings. A white marking at end of cell, with detached rays beyond, persists in both sexes.

Expanse.—Male, 16 mm.; female, 18–21 mm.

Genitalia figured from specimens from San Diego, Calif. (K. R. Coolidge, No. 199).

Specimens before us from the coastal region of southern California.

Life history unknown.

Types.—In National Collection (*epia*); collection Barnes (*damon*).

Type localities.—Laguna Beach, Calif. (*epia*); San Diego, Calif. (*damon*).

XANTHOPHERNE, new genus

Front gently bulging and smooth, or strongly cone-shaped and tuberculate. No ocelli. Labial palpi porrect, short, of the same length as the maxillary palpi, which are heavily dilated with scales. Antennae thickened, shortly squarely serrate and pubescent in the male; filiform in the female. Fore wing with vein 3 from before angle of cell; 4 and 5 approximate from the angle; 6 shortly below apex of cell; 7 from apex; 8–9 stalked from before the rounded apex; 10 from the cell near stalk of 8–9; 11 obliquely anastomosing with 12. Hind wing with 4–5 connate from the sharp angle of cell; 6 from apex of cell; 7 leaving apex of cell for a rather short anastomosis with 8.

Male genitalia with vinculum rounded. Harpe undivided, elongately triangular. Uncus laterally compressed and greatly devel-

oped. Gnathos hook-like and very heavy; unspined. Anellus a slightly curved plate with strongly developed lateral arms. Aedoeagus stout.

Female with ductus bursae short, strongly chitinized (the differentiation of ductus and bursa in this genus and *Doratoperas* is rather difficult and in both we identify the bursa as beginning at the end of the chitinization of the ductus). Bursa copulatrix long and considerably enlarged at extremity; without signum. Ovipositor and supporting rods normal.

Abdomen of male without lateral hair tufts on second segment.

For purposes of comparison we give, in addition to the figures of *Xanthropherne*, figures (26, 77) of the male and female genitalia of *Doratoperas atrosparsellus* Walker, the type of Hampson's genus.

We have taken two species out of *Doratoperas* Hampson to form this genus on account of the anastomosis of veins 11–12 of fore wing. Otherwise the species agrees with *Doratoperas*, from which they are doubtless derived.[8]

Genotype.—*Doratoperas biumbrata* Schaus.

KEY TO THE SPECIES OF XANTHROPHERNE

1. Fore wing with discal and terminal dots and faint outer line; front flat. **fulvescens** (Hampson)

   Fore wing without dots; outer line broad, shaded, widening below; front strongly cone shape ---------------------------------- **biumbrata** (Schaus)

XANTHOPHERNE FULVESCENS (Hampson)

Figure 27

Doratoperas fulvescens Hampson, Ann. Mag. Nat. Hist., ser. 4, vol. 4, 1919, p. 61.

We possess a single male of this species from the type locality. It has the general appearance of a light colored *Doratoperas*. The hind wings are nearly white.

Expanse.—42 mm.

Male genitalia figured.

The life history is unknown.

Type.—In British Museum.

Type locality.—Yahuarmayo, Peru.

XANTHOPHERNE BIUMBRATA (Schaus)

Figure 75

Doratoperas biumbrata Schaus, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 145.

The single female type is before us, collected by Doctor Schaus and Mr. Barnes.

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[8] *Doratoperas xanthoterma* Hampson is unknown to us in nature and may or may not be found referable to *Xanthopherne*.

Expanse.—65 mm.

Female genitalia figured.

Type.—In National Collection.

Type locality.—Volcan de Santa Maria, Guatemala.

Genus SILVERIA Dyar

Silveria DYAR, Ins. Ins. Mens., vol. 13, 1925, p. 10.

Front gently convex, smooth. Ocelli present. Labial palpi long, porrect, slender, extending over twice the length of the head. Maxillary palpi triangularly dilated with narrow scales. Antennae of male slightly thickened; of female filiform. Fore wing with vein 3 from before angle of cell; 4 and 5 separate, from the angle; 6 from well below apex of cell; 7 from apex; 8 and 9 long stalked, from before apex; 10 close to the stalk of 8–9; 11 anastomosing with 12. Hind wing with 4 and 5 approximate, from angle of cell; 6 from the cross-vein below apex of cell; 7 from the apex, anastomosing with 8 for over half its length.

Male genitalia with vinculum triangular. Harpe undivided; triangular; costa simple, rather weakly chitinized. Uncus and gnathos hooklike; gnathos unspined. Anellus consisting of a detached juxta, and a flattened plate hinged to bases of harpes and set at right angle with aedoeagus, and with a pair of greatly produced slender arms arising from the plate and lying along underside of aedoeagus. Aedoeagus very long and flattened.

Female genitalia with ductus bursae short and heavily chitinized. Bursa copulatrix narrow and greatly elongated; without signum. Ovipositor and supporting rods normal.

Abdomen of male without tufts on second segment.

The peculiarly developed aedoeagus and anellus are the distinguishing genitalic characters. They are approached in *Chilo phragmitellus* Hübner of Europe; but that is to be expected, for in *Chilo* one finds nearly all the Crambid genitalia types reproduced.

Genotype.—*Silveria hexhex* Dyar.

KEY TO THE SPECIES OF SILVERIA

1. Black irrorations of fore wing evenly scattered. **chiriquitensis** (Zeller) (p. 31)
   Black irrorations forming lines on the veins________ **hexhex** Dyar (p. 32)

SILVERIA CHIRIQUITENSIS (Zeller)

Figures 43, 44

Eromene chiriquitensis ZELLER, Hor. Ent. Soc. Ross., vol. 13, 1877, p. 72.
Silveria adelphilia DYAR, Ins. Ins. Mens., vol. 13, 1925, p. 11.

This species is before us from Mexico and Guatemala.

Expanse.—Male, 11–12 mm.; female, 15–18 mm.

There are not genitalic differences of any kind between specimens from the two localities.

Male genitalia figured from type of *adelphilia;* female from specimen from Venadio, Mexico.

Life history unknown.

Type.—In collection Staudinger (*chiriquitensis*); National Collection (*adelphilia*).

Type locality.—Chiriqui, Mexico (*chiriquitensis*); Colima, Mexico (*adelphilia*).

SILVERIA HEXHEX Dyar

Figure 45

Silveria hexhex DYAR, Ins. Ins. Mens., vol. 13, 1925, p. 11.

The male and female types are before us from the type locality; no other specimens. The species is readily distinguishable from *chiriquitensis* by the black irrorations lying along the veins.

Expanse.—Male, 14 mm.; female, 18 mm.

In the female the genitalia are distinguished from those of *chiriquitensis* by their differently shaped (narrower and straighter) ductus bursae. Unfortunately the abdomen of the type of *hexhex* was damaged and the genitalia missing so no comparison could be made with the male genitalia of *chiriquitensis.*

Female genitalia figured from paratype.

Life history unknown.

Type.—In National Collection.

Type locality.—Colima, Mexico.

Genus HAIMBACHIA Dyar

Haimbachia DYAR, Proc. Ent. Soc. Washington, vol. 11, 1909, p. 28.—FORBES, Journ. New York Ent. Soc., vol. 28, 1920, p. 221; Mem. 68, Cornell Univ. Agr. Exp. Sta., 1923, p. 593.

Front convex, smooth. Ocelli present. Palpi long, porrect, slightly down-curved, extending over twice the length of head. Antennae slightly thickened in the male; filiform in the female. Fore wing with vein 3 from before angle of cell; 4 and 5 separate, from the angle; 6 from below apex of cell; 7 from apex; 8–9 long stalked; 10 free and near the stalk of 8–9; 11 anastomosing with 12. Hind wing with veins 4 and 5 approximate at origin but divergent; 6 from apex of cell with 7, which anastomoses rather shortly with 8.

Male genitalia with vinculum greatly enlarged; oblong or approximately square beneath and normally with posterior ventral margin incurvate. Harpe divided, with costa produced as a hook with broad lobed base. Uncus stout, stubby, with apex rounded and a short pointed subapical spur beneath. Gnathos short, stout, and sharply

hooked (uncus and gnathos in profile resembling a pair of short nipper jaws). Anellus semitubular and without lateral arms; no detached juxta.

Female genitalia with ductus bursae moderately long, chitinized only toward genital opening. Bursa copulatrix moderately large; normally with two signa, rarely with single signum (*discalis*). Supporting rods of ovipositor markedly dilated. Collar of eighth segment fused and with tongue projecting from anterior ventral margin and curving back behind genital opening.

Abdomen of male without tufts on second segment.

The genitalic characters given above at once distinguish *Haimbachia* from all other genera in the group with vein 11 of forewing anastomosing with 12; but many of the characters are duplicated in genera of other groups, the chitinous tongue from a fused collar of the eighth segment to the genital opening occurring in *Xubida*, *Eoreuma*, and *Chilo* (examples, *loftini* Dyar and *forbesellus* Fernald), and the dilated ovipositor rods and characteristically shaped vinculum in *Eoreuma densellus* and *Chilo loftini*. However, in both *Eoreuma* and *Chilo*, where the vinculum is like that of *Haimbachia*, there is much more marked asymmetry in the harpe than occurs in any species of *Haimbachia*. One species (*prosenes*) which we have referred here does not exhibit any of the female genitalia characters characteristic of the genus. It probably needs a new generic designation; but as we have no male, and as it otherwise agrees with *Haimbachia*, we have been compelled to place it there.

Genotype.—*Crambus placidellus* Haimbach.

COLOR AND PATTERN KEY TO THE SPECIES OF HAIMBACHIA

1. Fore wing with one or more cross lines ____ 2
   Fore wing without cross lines ____ **prosenes** (Dyar) (p. 37)
2. Central line of fore wing straight (yellow) ____ **gloriella** Schaus (p. 34)
   Central line of fore wing bent or oblique, sometimes obsolete ____ 3
3. Central line broad, angeled out in cell (yellow).
   placidella (Haimbach) (p. 35)
   Central line narrow or obsolete ____ 4
4. Whitish gray species ____ {**squamulella** (Zeller) (p. 35) / **quiriguella** Schaus (p. 35)}
   Brownish species ____ 5
5. Without discal dot on fore wing ____ {**dumptalis** Schaus (p. 36) / **maroniella** Dyar and Heinrich (p. 36)}
   Discal dot present on forewing ____ **discalis** Dyar and Heinrich (p. 37)

KEY TO THE SPECIES OF HAIMBACHIA ON CHARACTERS OF THE GENITALIA—MALES

1. Apex of aedoeagus curved, hooklike ____ {**gloriella** Schaus (p. 34) / **discalis** Dyar and Heinrich (p. 37)}
   Apex of aedoeagus not curved ____ 2

2. Harpes asymmetrical { **squamulella** (Zeller) (p. 35) / **quiriguella** Schaus (p. 35) }
Harpes symmetrical 3
3. Projecting costal lobe of harpe approximately triangular.
placidella (Haimbach) (p. 35)
Projecting costal lobe of harpe rounded 4
4. Vinculum with deeply excavate posterior margin **dumptalis** Schaus (p. 36)
Vinculum with straight posterior margin.
maroniella Dyar and Heinrich (p. 36)

1. With projecting tongue from 8th segment collar, curving back behind genital opening; supporting rods of ovipositor greatly dilated 2
Without such projecting tongue; ovipositor rods simple.
prosenes (Dyar) (p. 37)
2. Projecting tongue forked at apex 3
Projectng tongue unforked (scarcely incurvate) at apex.
maroniella Dyar and Heinrich (p. 36)
3. Bursa with single signum **discalis** Dyar and Heinrich (p. 37)
Bursa with two signa 4
4. Signa large, thornlike **quiriguella** Schaus (p. 35)
Signa developed as two irregular patches with a short sharp spine arising from each **gloriella** Schaus (p. 34)
Signa two-minute scobinate patches 5
5. Ductus chitinized for less than half its length **dumptalis** Schaus (p. 36)
Ductus chitinized for a trifle more than half its length.
squamulella (Zeller) (p. 35)

HAIMBACHIA GLORIELLA Schaus

Figures 36, 71

Haimbachia gloriella SCHAUS, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 137.

A species generally similar to *squamulella* Zeller, but with less disparity in the size of the sexes.

Expanse.—Male, 12–15 mm.; female, 15–16 mm.

The male genitalia are chiefly distinguished by the backwardly curved hooklike apex of aedoeagus (found elsewhere in the genus only in *discalis*) and the almost square vinculum.

In the female the most striking character is the shape of the signa of the bursa; these are developed as two irregular weak chitinous patches with a very short, sharp spine arising from each.

Genitalia figured from specimens from the type locality.

Specimens before us from Venadio and Guadalajara, Mexico.

Life history unknown.

Type.—In National Collection.

Type locality.—Venadio, Sinoloa, Mexico.

HAIMBACHIA PLACIDELLA (Haimbach)

Figure 39

Crambus placidellus Haimbach, Ent. News, vol. 18, 1907, p. 44.
Chilo placidellus (Haimbach) Kearfott, Proc. U. S. Nat. Mus., vol. 30, 1908, p. 392.
Haimbachia placidella (Haimbach) Dyar, Proc. Ent. Soc., Washington, vol. 11, 1909, p. 28.—Barnes and McDunnough, List Lepid. Bor. Amer., No. 5401, 1917.

Larger than *squamulella*, yellowish and differently marked. Only males are before us, from Connecticut and New Jersey.

Expanse.—Male, 15–17 mm.

Male genitalia distinguished by the slender costal hook and the nearly triangular projecting, costal lobe of harpe. Figured from specimens from Essex County Park, N. J.

Life history unknown.

Type.—In National Collection.

Type locality.—Wenonah, N. J.

HAIMBACHIA SQUAMULELLA (Zeller)

Figures 37, 74

Chilo squamulellus Zeller, Hor. Ent. Soc. Ross., vol. 16, 1881, p. 158.—Fernald, Cramb. N. Amer., Special Bull. Mass. Agr. Coll. 1896, p. 79; in Dyar List, Bull. 52, U. S. Nat. Mus., No. 4630, 1903.
Platytes squamulella (Zeller) Barnes and McDunnough, List. Lepid. Bor. Amer., No. 5426, 1917.

Wings chalky white, sprinkled with black atoms, the markings mostly terminal.

Expanse.—Male, 11–13 mm.; female, 20 mm.

Male genitalia with harpes asymmetrical; costal hook of left harpe sinuate (twice bent); that of right harpe evenly curved.

Female genitalia with ductus chitinized for nearly half its length. Sigma developed as two minute spines.

Genitalia figured from specimens from Washington, D. C. (male), and Texas (female).

Specimens before us from Texas, North Carolina, District of Columbia.

Life history unknown.

Type.—(?)

Type locality.—Bosque County, Tex.

HAIMBACHIA QUIRIGUELLA Schaus

Figures 38, 73

Haimbachia quiriguella Schaus, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 137.
Haimbachia prestonella Schaus, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 138.

Entirely similar to *squamulella* in color and markings and in the disparity of the sexes, but differing in details of the genitalia. We take *quiriguella* from Guatemala and Costa Rica to be the female and *prestonella* from Mexico the male of one species.

Expanse.—Male, 11 mm.; female, 17–18 mm.

Male genitalia as in *squamulella*, except with broader costal hook on left harpe. Figured from type of *prestonella.*

Female genitalia at once distinguished by the large thornlike signa of bursa. Figured from type of *quiriguella.*

Type.—In National Collection.

Type localities.—Quirigua, Guatemala (*quiriguella*); Venadio, Sinoloa, Mexico (*prestonella*).

HAIMBACHIA DUMPTALIS Schaus

Figures 41, 69

Haimbachia dumptalis, SCHAUS, Proc. Ent. Soc. Washington, vol. 24, 1922, p. 137.

Fore wing narrow, crambiform, the markings obscure. The sexes are similar in size.

Expanse.—15 mm.

Male genitalia as in *placidella*, except that projecting basal costal lobe of harpe is semicircular rather than triangular.

Female genitalia similar to those of *squamulella*, but with ductus bursae less chitinized. Bursa with two signa developed as minute, scobinate patches.

Genitalia figured from specimens from Cayuga, Guatemala.

We have two males, including the type, and two females, all from Guatemala (Schaus and Barnes).

Type.—In National Collection.

Type locality.—Cayuga, Guatemala.

HAIMBACHIA MARONIELLA, new species

Figures 35, 70

Entirely similar in color and size to *dumptalis* Schaus, but differing in locality and genital structure.

The male genitalia are distinguished by the tapering vinculum with rather narrow, straight posterior margin; and the female by the unforked (scarcely incurvate) apex of the tongue from the 8th segment collar; signa developed as two small scobinate patches.

Genitalia figured from type and paratype.

Three males and a female are before us, all from the type locality, August, 1904 (W. Schaus).

Type.—Cat. No. 29435, U.S.N.M.

Type locality.—"Sixty miles up the Maroni River," French Guiana.

HAIMBACHIA DISCALIS, new species

Figure 72

Wings broader and more normally shaped than in *dumptalis* and *maroniella*. The whitish ground or fore wing is thickly strewn with black atoms; a large rounded black discal dot, between which and the inner margin is a faint yellow band, emphasized there by a blackish spot, less distinct costally; a narrow outer white line, indicated by double oblique brown streaks on costa, curves sharply outward and runs near the margin; a terminal black line; at tornus three black spots in a yellow area; fringe plumbeous interlined. Hind wing whitish, more or less pale fuscous suffused.

Expanse.—Male and female, 13–18 mm.

Male genitalia as in *gloriella* Schaus.

Female genitalia distinguished by the (spined) single signum of bursa. Figured from paratype.

Ten old specimens from Jalapa and Orizaba, Mexico, collected by Doctor Schaus many years ago.

Type.—Cat. No. 29436, U.S.N.M.

Type locality.—Jalapa, Mexico.

HAIMBACHIA (?) PROSENES (Dyar)

Figure 76

Diatraea prosenes DYAR, 1st Ann. Rept. Laguna Mar. Lab., 1912, p. 165.
Chilo prosenes (Dyar) BARNES and MCDUNNOUGH, List Lepid. Bor. Amer., No. 5433, 1917.

A rather large species; white; the median line absent; subterminal line single and brown (not white) and bordered as usual.

Expanse.—Female, 20–23 mm.

Female genitalia figured from specimen from La Puerta Valley, Calif.; different from anything else in the genus and exhibiting none of the typical characters; no chitinous tongue from collar of 8th segment; bursa very small and without trace of signa; supporting rods of ovipositor not dilated.

This species does not belong strictly to *Haimbachia;* but without male we can make no other reference. Specimens before us from southern California.

Life history unknown.

Type.—In National Collection.

Type locality.—Laguna Beach, Calif.

SPECIES REFERRED FROM DIATRAEA[4]

The following species have been described in or referred to *Diatraea*, but differ from the generic definition we have adopted and

[4] *Platytes dentilineatella* Barnes and McDunnough is mentioned and figured here only because it is an important enemy of sugar cane. We are referring it to the genus *Xubida.*

require new generic names. All (except *parallela*) have veins 11 and 12 of fore wing separate, and all (except *alleni*, *parallela*, and *berthellus*) are without ocelli. The only existing genus with these characters is *Doratoperas* Hampson; but this has short labial palpi:

Diatraea parallela Kearfott. We make this the type of the new genus *Alamogordia*.

Diatraea differentialis Fernald. We make this the type of the new genus *Diatraenopsis*.

Diatraea idalis Fernald. Referred to *Diatraenopsis*.

Crambus comptulatalis Hulst. We make this the type of the new genus *Occidentalia*.

Diatraea alleni Fernald. Referred tentatively to *Platytes*. Its genitalia are more like those of *Diatraenopsis;* but on other characters it agrees better with *Platytes.*

Diatraea berthellus Schaus. Referred to *Chilo* (sens. lat.).

ALAMOGORDIA, new genus

Front flat and smooth. Ocelli present. Labial palpi long, porrect, down-curved, extending for twice the length of the head. Maxillary palpi slender, slightly tufted with linear scales. Male antennae slightly thickened. Fore wing long and narrow; vein 2 from long before angle of cell, the vein angled; 4 and 5 separate, from angle of cell; apex of cell rounded; 6 from below it; 7 appearing also below; 8 and 9 stalked from apex; 10 approximate; 11 anastomosing with 12. Hind wing with 3 not far before angle of cell; 4–5 rather shortly stalked; 6 from apex of cell; 7–8 anastomosing.

Male genitalia with vinculum narrowly and elongately triangular. Harpe undivided, elongately triangular, evenly tapering to apex; costa finely spined on basal half, otherwise simple. Uncus moderately broad, with apex bluntly rounded (a somewhat broadened hook). Gnathos unspined. Anellus a flattened heart-shaped plate with a central incurvation, but without produced lateral arms; juxta detached.

Female genitalia unknown.

Abdomen of male without lateral tufts on second segment.

In genitalia most closely resembling *Hemiplatytes*, from which it differs in the shape of the harpe and the anellus, characters that are of hardly more than specific value. The genus, however, is readily distinguished from *Hemiplatytes* by its hind wing venation and the presence of ocelli. From *Haimbachia*, which it most resembles otherwise, it is separable on wing shape and genitalia.

Genotype.—Diatraea parallela Kearfott.

ALAMOGORDIA PARALLELA (Kearfott)

Figure 32

Diatraea parallela KEARFOTT, Proc. U. S. Nat. Mus., vol. 35, 1908, p. 391.—BARNES and McDUNNOUGH, List Lepid. Bor. Amer., No. 5439, 1917.

Fore wing yellow, with a longitudinal white ray through the cell from base to margin.

Male genitalia figured from type.

We have only males of the type series, from New Mexico.

Life history unknown.

Type.—In National Collection.

Type locality.—Alamogordo, New Mexico.

DIATRAENOPSIS, new genus

Front nearly flat and smooth. No ocelli. Labial palpi porrect, moderate, not extending twice the length of the head. Maxillary palpi heavily tufted with linear scales. Antenna of male slightly thickened; of female filiform. Fore wing with veins 4–5 separate at origin; 6–7 from the cell; 8–9 stalked; 10–11 from the cell, 11 free. Hind wing with vein 6 from apex of cell.

Male genitalia with vinculum rounded beneath, much enlarged. Harpe divided, with costa developed as a free curved hook with a very broad base. Uncus triangular tapering to a blunt hook. Gnathos a heavy semicircular band terminating in a short hook; unspined. Anellus a simple flattened plate with a detached juxta and without lateral arms.

Female genitalia with ductus bursae rather long, chitinized only toward genital opening. Bursa moderately large; without signum. Ovipositor and supporting rods normal.

Abdomen of male without tufts on second segment.

Genotype.—*Diatraea differentialis* Fernald.

DIATRAENOPSIS DIFFERENTIALIS (Fernald)

Figures 34, 79

Diatraea differentialis FERNALD, Ent. Amer., vol. 4, 1888, p. 120.—FERNALD, in Dyar List, Bull. 52, U. S. Nat. Mus., No. 4626, 1903.—BARNES and McDUNNOUGH, List, Lepid. N. Amer., No. 5441, 1917.

A very large species with the male fore wing blackish brown, the female lighter brown.

The male genitalia (figured from type) are strikingly like those of *Platytes* (?) *alleni* Fernald, the only appreciable difference being in the shape of the uncus and gnathos.

The female genitalia (figured from paratype) are easily recognized by the heavy and corrugated chitinization surrounding the genital opening and extending to the lower tips of the ovipositor lobes.

Three specimens are before us from the type locality.

Type.—In National Collection.

Type locality.—Florida.

DIATRAENOPSIS IDALIS (Fernald)

Figure 78

Diatraea idalis FERNALD, Cramb. N. Amer., Special Bull. Mass. Agr. Coll., 1896, p. 76.—FERNALD, in Dyar List, Bull. 52, U. S. Nat. Mus., No. 4627, 1903.—BARNES and McDUNNOUGH, List Lepid. Bor. Amer., No. 5442, 1917.—FORBES, Mem. 68, Cornell Univ. Agr. Exp. Sta., 1923, p. 591.

The female type has a conical tuberculate front, but otherwise falls here. There are no ocelli.

The female genitalia (figured from type) are so different from those of the preceding species as to suggest a possible generic separation. There is no armature about the genital opening except the smoothly chitinized tube of the ductus, and the latter has a couple of small chitinized earlike flaps just at its juncture with the bursa. The supporting rods of the 8th segment collar are also longer than in *differentialis*.

Type.—In National Collection.

Type locality.—New Jersey.

The specimen referred as the male of this species by Fernald has ocelli and may be placed in *Chilo*. We are proposing for it the name *Chilo fernaldalis*.

CHILO FERNALDALIS, new species

Figure 31

Diatraea idalis FERNALD (male not female), Cramb. N. Amer., Special Bull. Mass. Agr. Coll., 1896, p. 76.

Palpi long, porrect and down-curved. Antennae of male thickened subserrate. Fore wing broad; apex acute but not as pointed as in *idalis;* uniform gray, irregularly dusted with blackish; a shaded outer blackish line; a faint dark mark at end of cell. Hind wing pale gray.

Expanse—22 mm.

Male genitalia with vinculum narrow, rounded. Harpe undivided; elongately triangular; costa with a smooth projection from base. Uncus moderately broad, with apex bluntly rounded. Gnathos hooklike, unspined. Anellus a plate with long, slender, lateral arms;

juxta detached. Aedoeagus with a long scobinate tongue attached to under side near base. Figured from type.

One specimen before us from cellection C. V. Riley (A. Oemler, collector); referred by Fernald as the male of *Diatraenopsis idalis*; two others from the C. H. Fernald Collection, labeled "Georgia" and "414, 433," and by Fernald "*Chilo*," probably all from the same source.

Type.—Cat. No. 29437, U.S.N.M.

Type locality.—Wilmington Island, Ga.

CHILO BERTHELLUS (Schaus)

Diatraea berthellus SCHAUS (in Dyar), Ent. News, vol. 22, 1911, p. 206.

OCCIDENTALIA, new genus

Front strongly conically produced and tuberculate. Labial palpi porrect and down-curved, not extending twice the length of the head. Antennae filiform. Venation as in *Diatraenopsis*. The wings rounded apically; in the female disproportionately small for the heavy abdomen, but form otherwise slender.

Male genitalia with vinculum produced beneath into an extended tongue. Harpe undivided, but with costa stoutly and broadly chitinized at base and produced into a short stout subbasal hook. Uncus a somewhat flattened and broadened hook (as in *Alamogordia* and *Hemiplatytes*). Gnathos unspined. Anellus semitubular without produced lateral arms (as in *Haimbachia*); no detached juxta.

Female genitalia with ductus bursae chitinized for a short distance from genital opening; rather long. Bursa copulatrix moderately sized and without signa. Ovipositor reduced. Supporting rods of ovipositor and eighth segment collar very long. Eighth to tenth segments greatly elongated and telescopic.

Abdomen of male without hair tufts on second segment.

Genotype.—*Crambus comptulatalis* Hulst.

OCCIDENTALIA COMPTULATALIS (Hulst)

Figures 42, 81

Crambus comptulatalis HULST, Trans. Amer. Ent. Soc., vol. 13, 1886, p. 167.

Chilo comptulatalis (Hulst) FERNALD, in Dyar List, Bull. 52, U. S. Nat. Mus., No. 4631, 1903.—BARNES and MCDUNNOUGH, List Lepid. Bor. Amer., No. 5431, 1917.

Diatraea comptulatalis (Hulst) FORBES, Memo. 68, Cornell Univ. Agr. Exp. Sta., 1923, p. 591.

Sexually dimorphic, the males brown, the females more yellowish and with a distinct outer line.

Expanse.—Male, 21–25 mm.; female, 22–30 mm.

Genitalia figured from specimens from Denver, Colo. (male), and Provo, Utah (female).

Specimens before us from Quebec (Canada), Minnesota, Colorado, Utah, Washington.

The life history was observed by Riley; under No. 471[x] is the note: "Pyralid in stems of Juncus, Minnetonka Lake, Minn., August, 1877."

Type.—(?).

Type locality.—Vancouver Island.

PLATYTES (?) ALLENI (Fernald)

Figure 33

Diatraea alleni Fernald, Ent. Amer., vol. 4, 1888, p. 120.—Fernald, in Dyar List, Bull. 52, U. S. Nat. Mus., No. 4625, 1903.—Barnes and McDunnough, Check List Lepid. Bor. Amer., No. 5440, 1917.

Fore wing with creamy white ground, showing rather broadly along inner margin, otherwise overspread with dark brown irrorations, leaving the veins rather broadly pale; a round, blackish discal dot; terminal line fine, black, tending to form dots between the veins, though not positively broken; fringe pale. Hind wing pale creamy, brownish shaded.

Expanse.—Male, 24–29 mm.

Male genitalia similar to those of *Diatraenopsis differentialis;* differing chiefly in the shape of the uncus and gnathos (compare figs. 33, 34). Figured from type.

Abdomen of male without hair tufts on second segment.

Four males before us; Maine and Connecticut.

Female and life history unknown.

Type.—In National Collection.

Type locality.—Orono, Me.

XUBIDA DENTILINEATELLA (Barnes and McDunnough)

Figures 40, 80

Platytes dentilineatella Barnes and McDunnough, Cont. Nat. Hist. Lepid, N. Amer., vol. 2, 1913, p. 138; List. Lepid. Bor. Amer., No. 5423, 1917.

Very similar to *Xubida dentilineella* Schaus.[5]

Genitalia figured from reared specimen from Potrero, Mexico.

Type.—In Barnes Collection.

Type locality.—Palmerlee, Ariz.

[5] (Proc. Ent. Soc. Washington, vol. 24, 1922, p. 141,) type of the genus *Xubida* Schaus. The names are unfortunately similar, though not identical. We notice the species *dentilineatella* because its larvae bore in sugar cane. The habits of *dentilineella* are unknown.

SPECIES UNRECOGNIZED

The following species, described in *Diatraea*, are unknown to us except by description:

Diatraea obliqualis Hampson, Ann. Mag. Nat. Hist., ser. 9, vol. 3, 1919, p. 543. From Argentina. Possibly referable to *Trinidadia.*

Diatraea endothermalis Hampson, Ann. Mag. Nat. Hist., ser. 9, vol. 3, 1919, p. 544. From Peru.

Diatraea lentistrialis Hampson, Ann. Mag. Nat. Hist., ser. 9, vol. 3, 1919, p. 546. From Argentina.

EXPLANATION OF PLATES

The drawings accompanying this paper were made under the authors' supervision by Miss Eleanor T. Armstrong, of the Bureau of Entomology. They were not drawn to scale, but to show structural differences.

Explanation of Symbols Applied to Genitalia

MALE

an=anellus.
clh=basal projection (lobe) from costa of harpe.
cn=cornutus (or cornuti) of penis.
gn=gnathos.
j=detached juxta of anellus.
ll=lateral lobes of tegumen.
spg=spining at apex of gnathos.
tg=tegumen.
u=uncus.
vm=vinculum.

FEMALE

bc=bursa copulatrix.
db=ductus bursae.
go=genital opening.

Plate 1

Abdominal tufts and male genitalia (*Diatraea*)

Fig. 1. Basal segments of male abdomen showing tufts (*X*) on caudal margin of second segment (*Diatraea saccharalis*).

2. *Diatraea saccharalis* (Fabricius), dissected genitalia: *A*=tegumen, uncus and gnathos (lateral view); *B*=aedoeagus; *C*= harpes, vinculum and anellus (ventral view).

3. *Diatraea magnifactella* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

4. *Diatraea pedibarbata* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*= aedoeagus.

PLATE 2

Male genitalia (*Diatraea*)

FIG. 5. *Diatraea busckella* Dyar and Heinrich: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

6. *Diatraea guatemalella* Schaus: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

7. *Diatraea tabernella* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

8. *Diatraea angustella* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

PLATE 3

Male genitalia (*Diatraea*)

FIG. 9. *Diatraea gaga* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

10. *Diatraea evanescens* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

11. *Diatraea zeacolella* Dyar: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

12. *Diatraea postlineella* Schaus: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

PLATE 4

Male genitalia (*Diatraea*)

FIG. 13. *Diatraea canella* Hampson: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

14. *Diatraea amnemonella* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

15. *Diatraea fuscella* Schaus: *A*=tegumen, uncus and gnathos (lateral view); *B*=same (three-quarters view); *C*=same (ventral view); *D*=harpes, vinculum and anellus (ventral view); *E*=aedoeagus.

PLATE 5

Male genitalia (*Diatraea*)

FIG. 16. *Diatraea venosalis* (Dyar): A=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

17. *Diatraea maronialis* Schaus: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

18. *Diatraea lineolata* (Walker): *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

PLATE 6

Male genitalia (*Diatraea*)

FIG. 19. *Diatraea schausella* Dyar and Heinrich: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

20. *Diatraea muellerella* Dyar and Heinrich: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

21. *Diatraea grandiosella* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=same (three-quarters view); *C*=harpes, vinculum and anellus (ventral view); *D*=aedoeagus.

PLATE 7

Male genitalia (*Diatraea*)

FIG. 22. *Diatraea bellifactella* Dyar: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=same (ventral view); *C*=same (lateral view); *D*=aedoeagus; *E*=harpes, vinculum and anellus (ventral view).

23. *Diatraea strigipennella* Dyar: *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

24. *Diatraea cayennella* Dyar and Heinrich: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

PLATE 8

Male genitalia (*Diatraea, Doratoperas, Xanthopherne*)

FIG. 25. *Diatraea castrensis* Dyar and Heinrich: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

26. *Doratoperas atrosparsellus* (Walker): *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

27. *Xanthopherne fulvescens* (Hampson): *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

PLATE 9

Male genitalia (*Iesta, Trinidadia, Hemiplatytes, Chilo*)

FIG. 28. *Iesta lisetta* Dyar: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

29. *Trinidadia minimifacta* (Dyar): *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

30. *Hemiplatytes epia* (Dyar): *A*=tegumen, uncus and gnathos (ventral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

31. *Chilo fernaldalis* Dyar and Heinrich: *A*=tegumen, uncus and gnathos (three-quarters view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

PLATE 10

Male genitalia (*Alamogordia, Platytes, Diatreanopsis*)

FIG. 32. *Alamogordia parallela* (Kearfott): *A*=tegumen, uncus and gnathos (ventral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

33. *Platytes alleni* (Fernald): *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

34. *Diatraenopsis differentialis* (Fernald): *A*=tegumen, uncus and gnathos (ventral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

PLATE 11

Male genitalia (*Haimbachia*)

FIG. 35. *Haimbachia maroniella* Dyar and Heinrich: *A*=tegumen, uncus and gnathos (ventral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

36. *Haimbachia gloriella* Schaus: *A*=tegumen, uncus and gnathos (lateral view; *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

37. *Haimbachia squamulella* (Zeller); *A*=aedoeagus; *B*=genitalia with aedoeagus omitted (ventral view).

38. *Haimbachia quirguella* Schaus; *A*=tengumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

PLATE 12

Male genitalia (*Haimbachia, Xubida, Occidentalia*)

FIG. 39. *Haimbachia placidella* (Haimbach): *A*=tegumen, uncus and gnathos (lateral view); *B*=harpes, vinculum and anellus (ventral view); *C*=aedoeagus.

40. *Xubida dentilineatella* (Barnes and McDunnough): *A*=genitalia (ventral view) with aedoeagus omitted; *B*=aedoeagus.

41. *Haimbachia dumptalis* Schaus: *A*=tegumen, uncus and gnathos (ventral view); *B*=harpes, vinculum and annelus (ventral view); *C*=aedoeagus.

42. *Occidentalia comptulatalis* (Hulst): *A*=genitalia (ventral view) with aedoeagus omitted; *B*=aedoeagus.

PLATE 13

Male and female genitalia (*Silveria, Iesta, Trinidadia*)

FIG. 43. *Silveria chiriquitensis* (Zeller): female genitalia (ventral view).

44. *Silveria chiriquitensis* (Zeller): male genitalia: *A*=lateral view of genitalia with aedoeagus omitted; *B*=aedoeagus.

45. *Silveria hexhex* Dyar: female genitalia (ventral view).

46. *Iesta morobe* Dyar: female genitalia (ventral view).

47. *Iesta lisetta* Dyar: female genitalia (ventral view).

48. *Trinidadia minimifacta* (Dyar): female genitalia (ventral view).

PLATE 14

Female genitalia (*Diatraea*)

FIG. 49. *Diatraea instructella* Dyar: ventral view.
50. *Diatraea continens* Dyar: ventral view.
51. *Diatraea indigenella* Dyar and Heinrich: ventral view.
52. *Diatraea magnifactella* Dyar: ventral view.
53. *Diatraea busckella* Dyar and Heinrich: ventral view.

PLATE 15

Female genitalia (*Diatraea*)

FIG. 54. *Diatraea saccharalis* (Fabricius): ventral view.
55. *Diatraea guatemalella* Schaus: ventral view.
56. *Diatraea angustella* Dyar: ventral view.
57. *Diatraea evanescens* Dyar: ventral view.
58. *Diatraea venosalis* (Dyar); ventral view.
59. *Diatraea zeacolella* Dyar: ventral view.

PLATE 16

Female genitalia (*Diatraea*)

FIG. 60. *Diatraea canella* Hampson: ventral view.
61. *Diatraea fuscella* Schaus: ventral view.
62. *Diatraea amnemonella* Dyar: ventral view.
63. *Diatraea lineolata* (Walker): ventral view.
64. *Diatraea maronialis* Schaus: ventral view.

PLATE 17

Female genitalia (*Diatraea*)

FIG. 65. *Diatraea cayennella* Dyar and Heinrich: ventral view.
66. *Diatraea strigipennella* Dyar: ventral view.
67. *Diatraea bellifactella* Dyar: ventral view.
68. *Diatraea grandiosella* Dyar: ventral view.

PLATE 18

Female genitalia (*Haimbachia*)

Ovipositors and collars of eighth segment shown in lateral view; seventh segment flattened somewhat to give ventral or three-quarters view of genital opening.

FIG. 69. *Haimbachia dumptalis* Schaus.
70. *Haimbcahia maroniella* Dyar and Heinrich.
71. *Haimbachia gloriella* Schaus.
72. *Haimbachia discalis* Dyar and Heinrich.
73. *Haimbachia quiriguella* Schaus.
74. *Haimbachia squamulella* (Zeller).

Plate 19

Female genitalia (*Xanthopherne, Haimbachia, Doratoperas*)

Fig. 75. *Xanthopherne biumbrata* (Schaus): ventral view.

76. *Haimbachia prosenes* (Dyar): three-quarters view of ovipositor and collar of eighth segment, ventral view of seventh segment and genital opening.

77. *Doratoperas atrosparsellus* (Walker): ventral view.

Plate 20

Female genitalia (*Diatraenopsis, Xubida, Occidentalia, Hemiplatytes*)

Fig. 78. *Diatraenopsis idalis* (Fernald): showing ovipositor and collar of eighth segment in lateral view; seventh segment and genital opening in ventral view.

79. *Diatraenopsis differentialis* (Fernald): lateral view.

80. *Xubida dentilineatella* (Barnes and McDunnough): lateral view.

81. *Occidentalia comptulatalis* (Hulst): ventral view.

82. *Hemiplatytes epia* (Dyar): ventral view.

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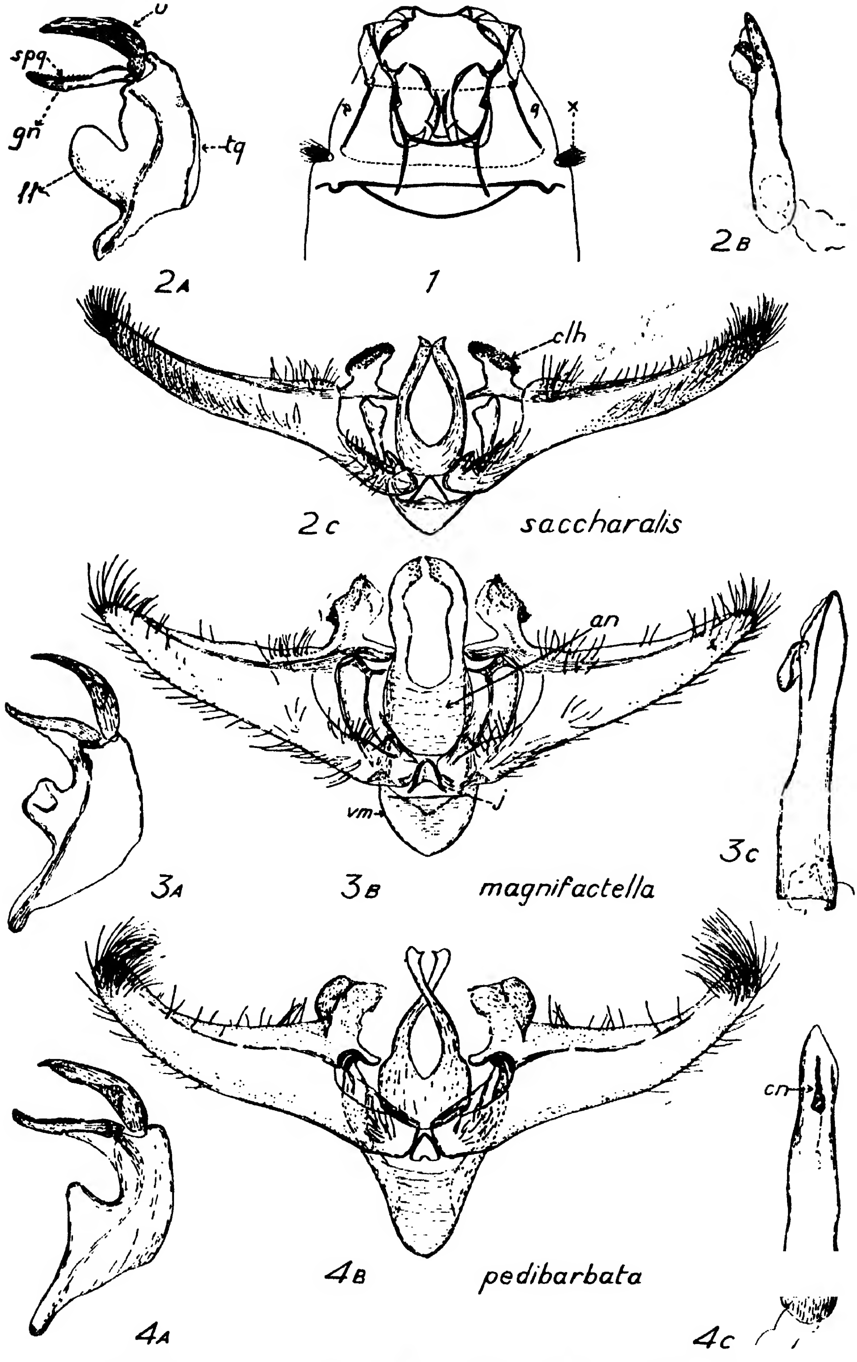

ABDOMINAL TUFTS AND MALE GENITALIA OF DIATRIAEA

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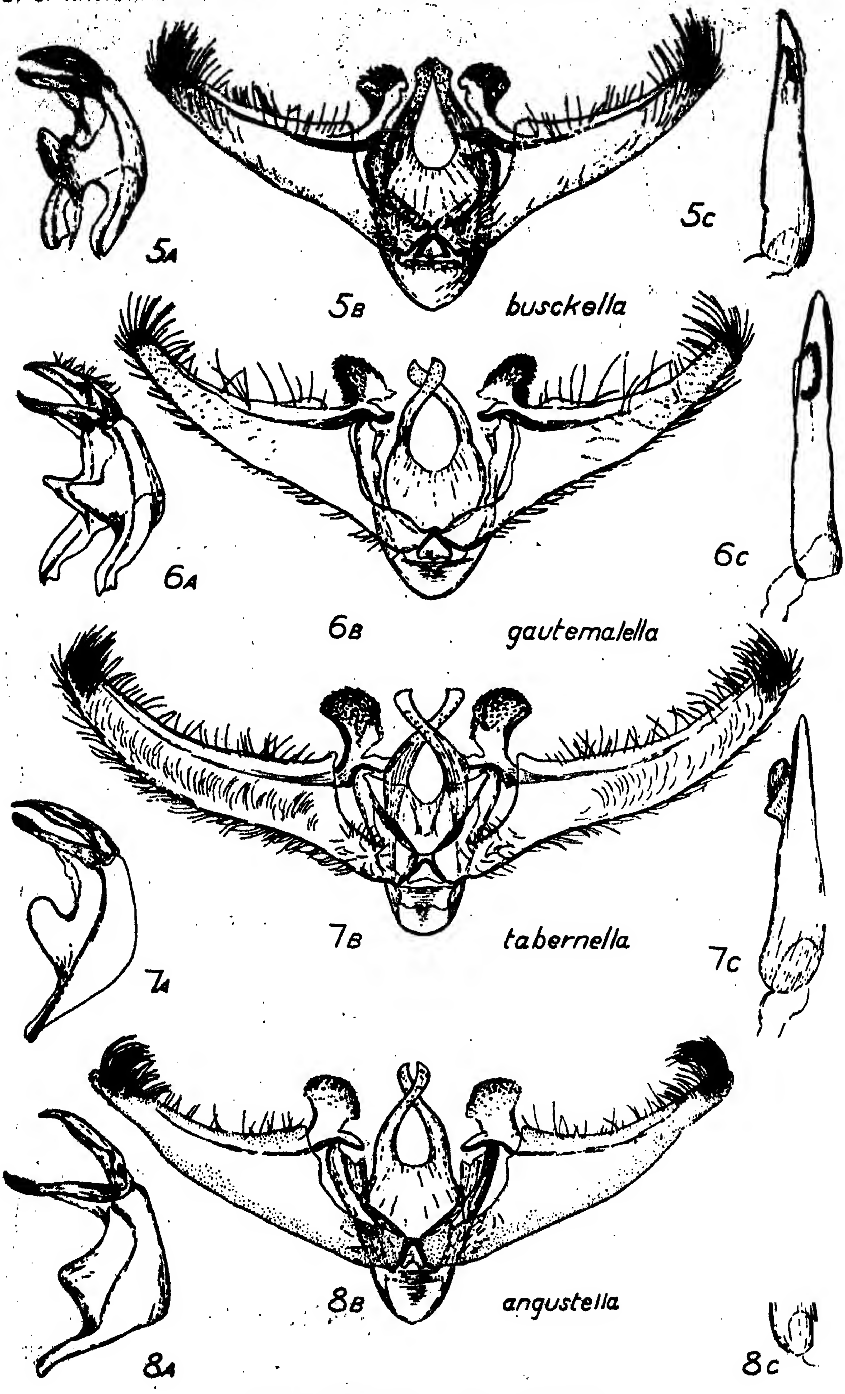
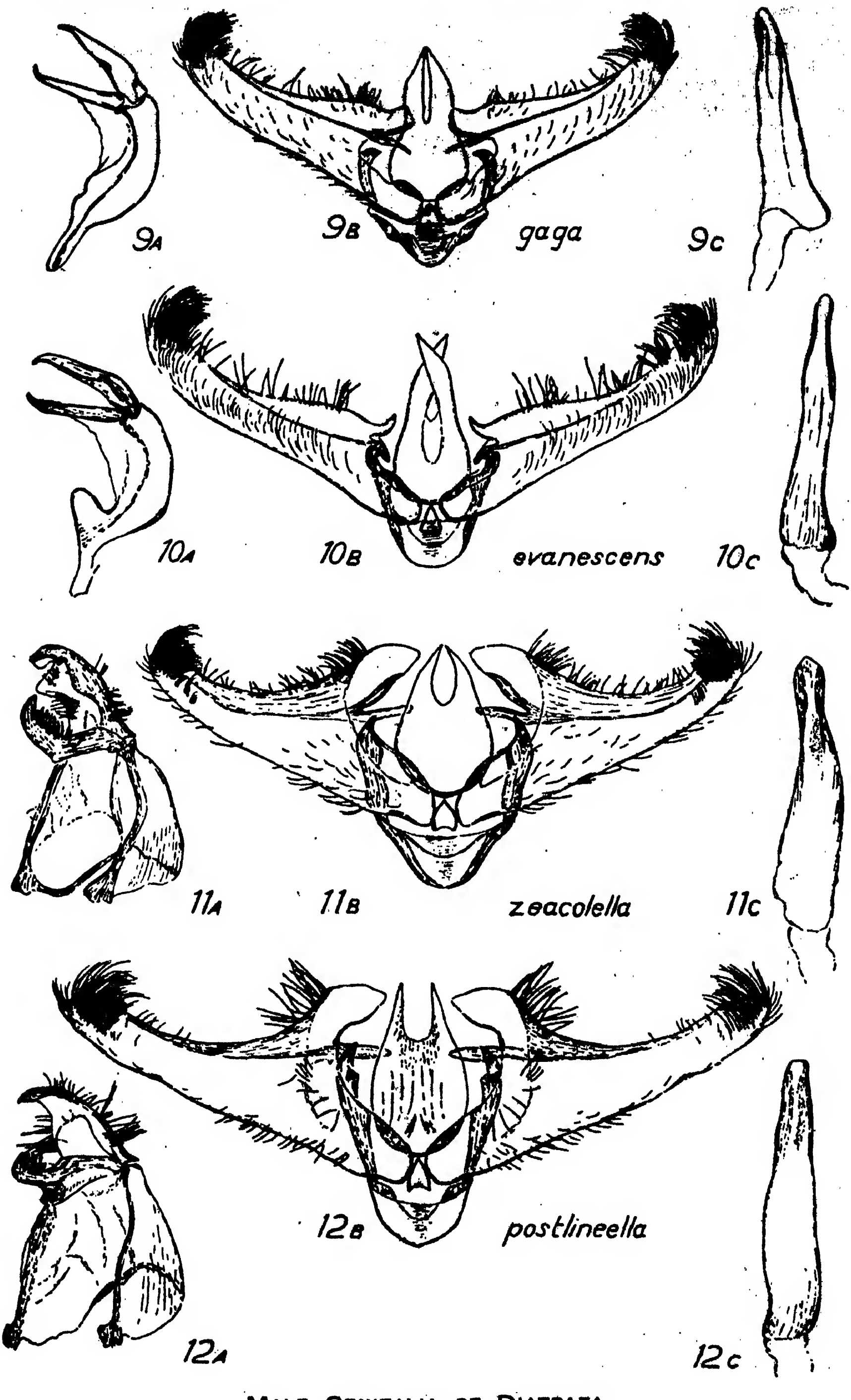


MALE GENITALIA OF DIATRAEA

FOR EXPLANATION OF PLATE SEE PAGE 44



MALE GENITALIA OF DIATRAEA

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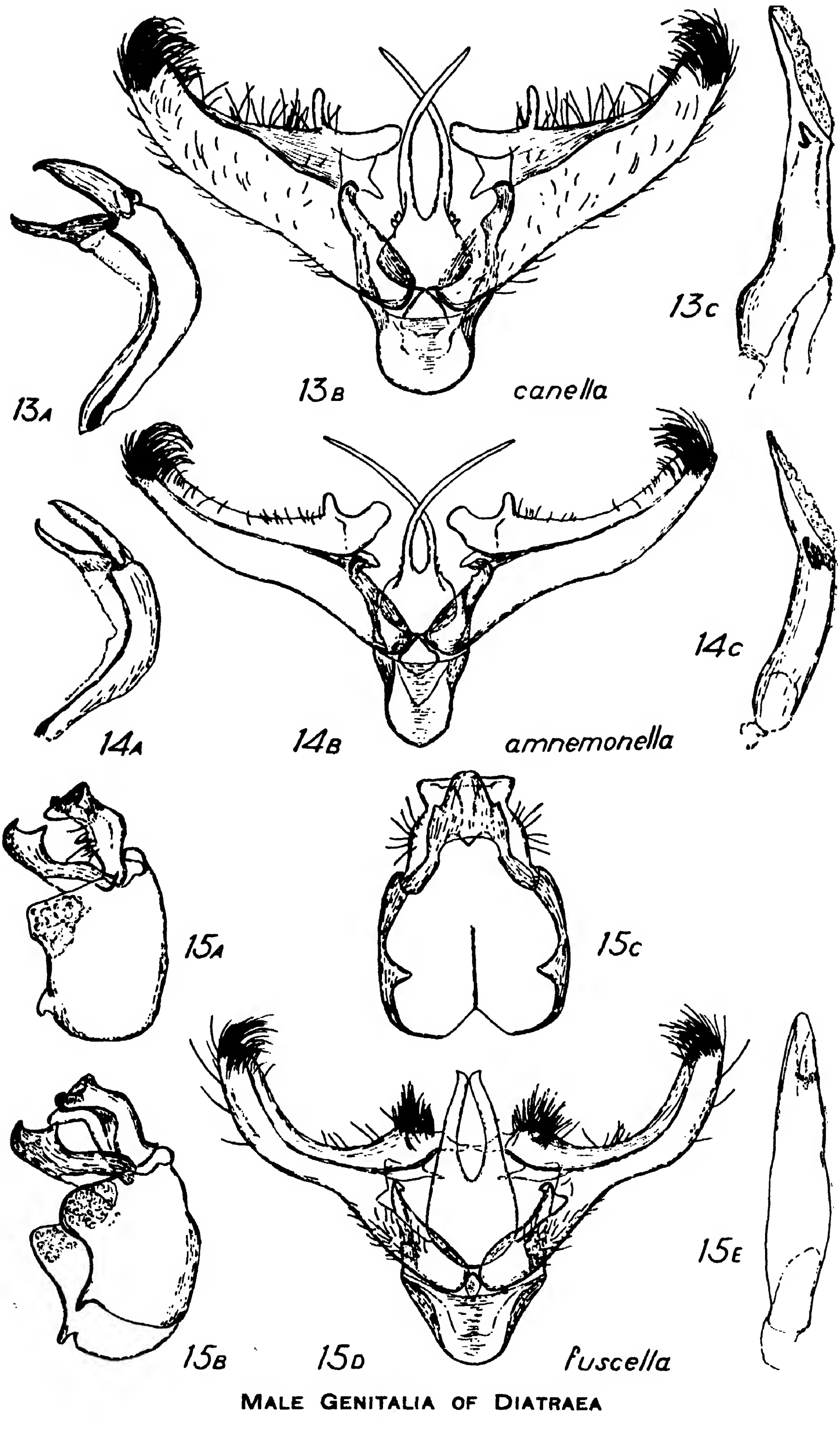
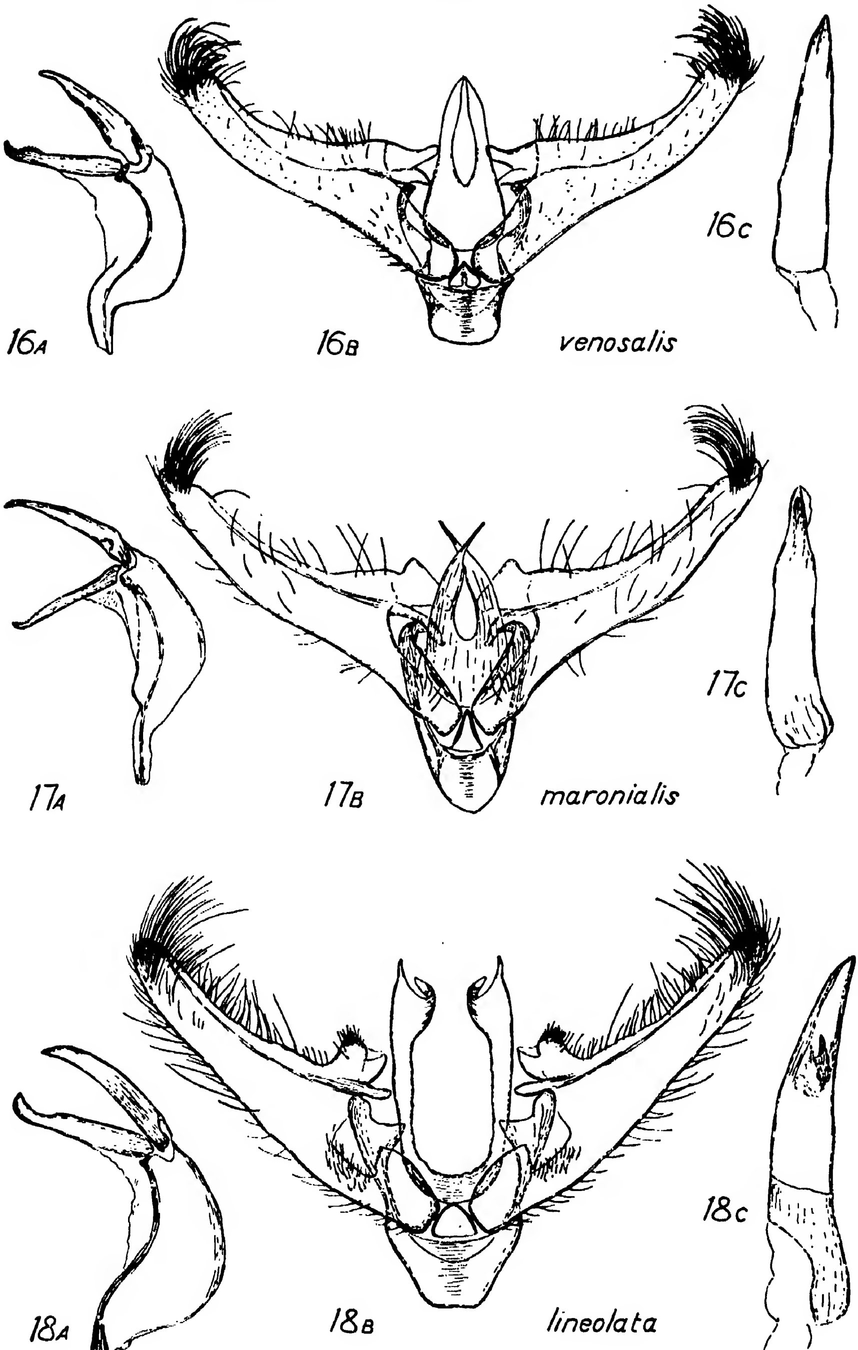
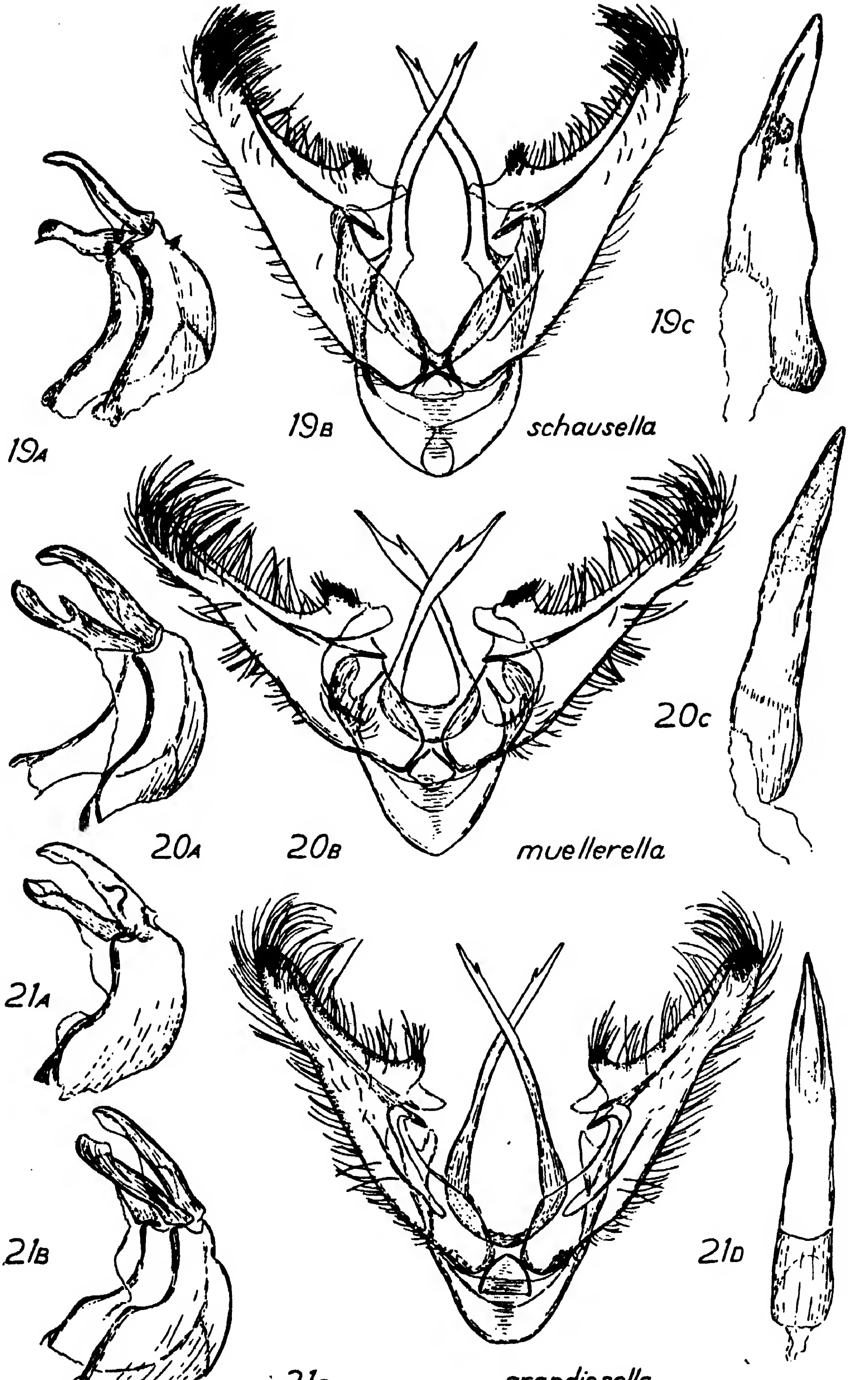


MALE GENITALIA OF DIATRAEA



MALE GENITALIA OF DIATRAEA

FOR EXPLANATION OF PLATE SEE PAGE 44



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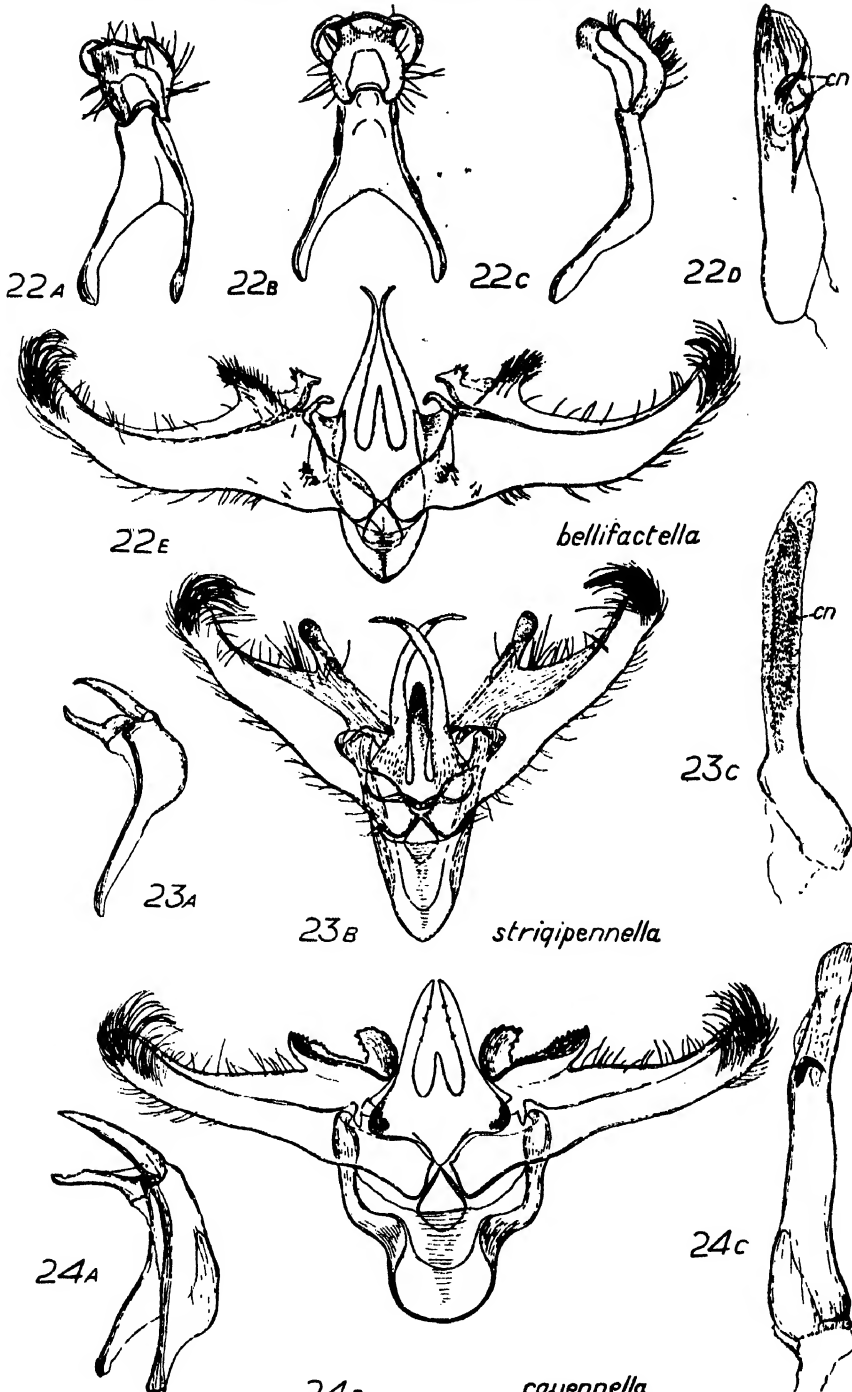

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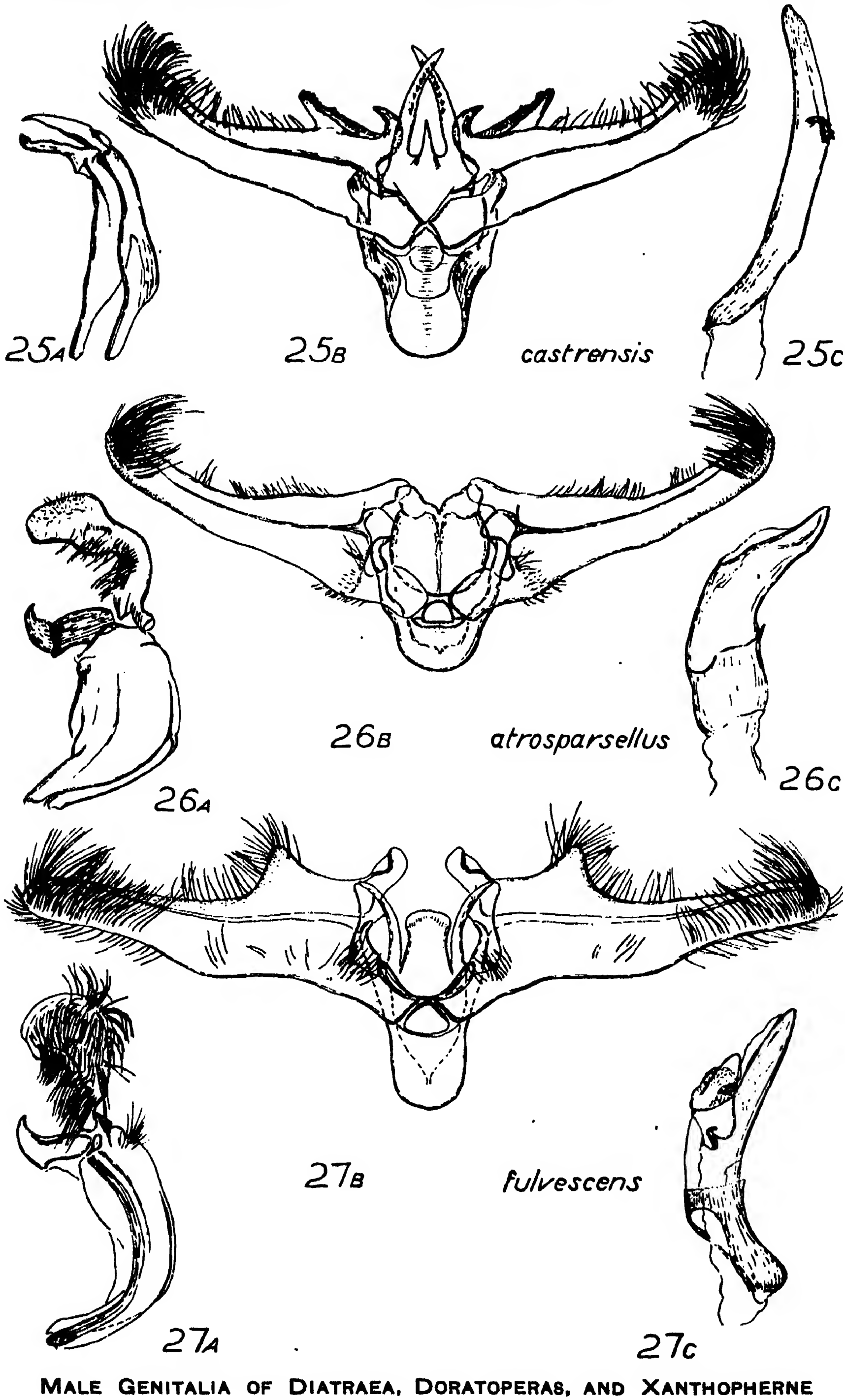
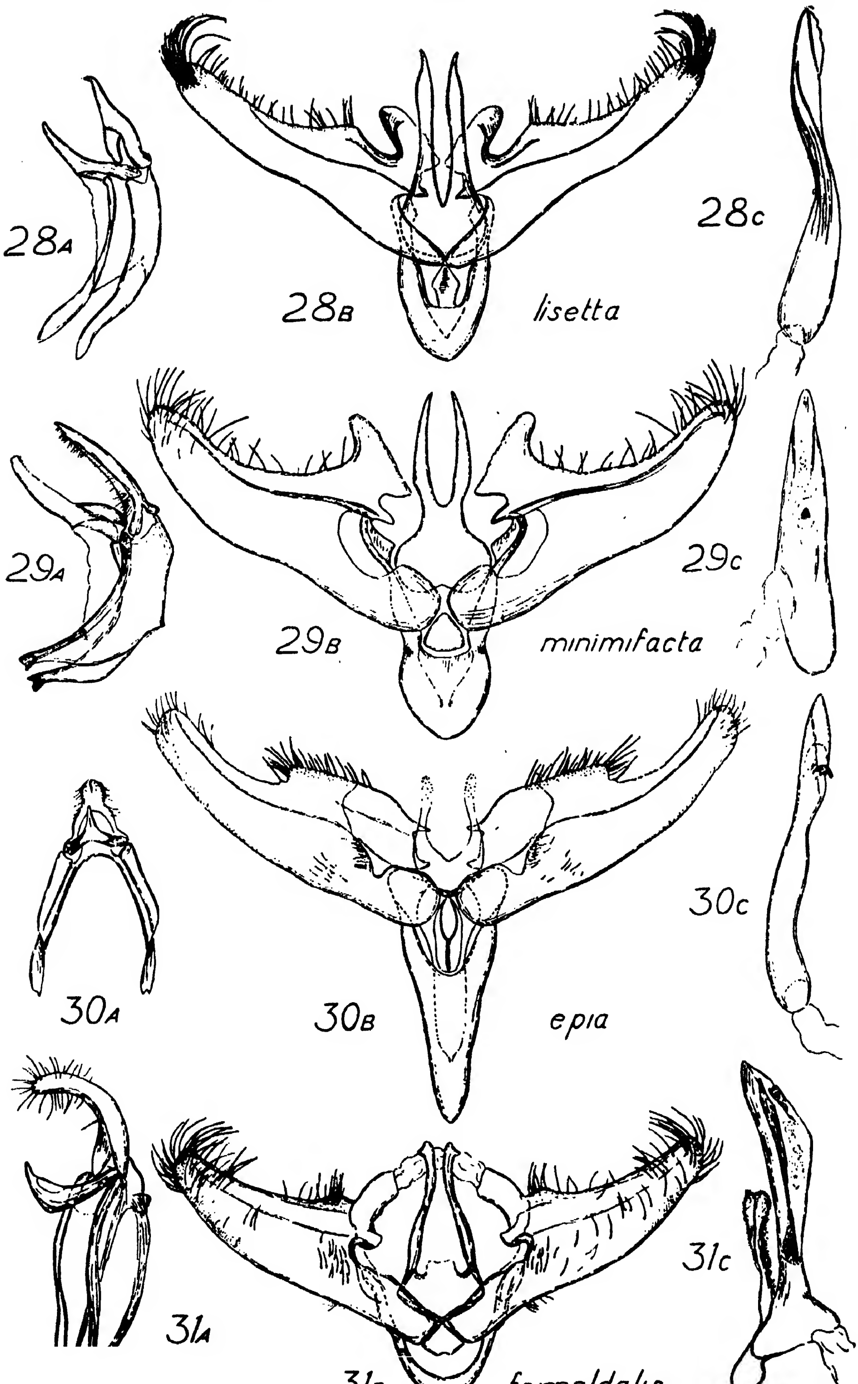
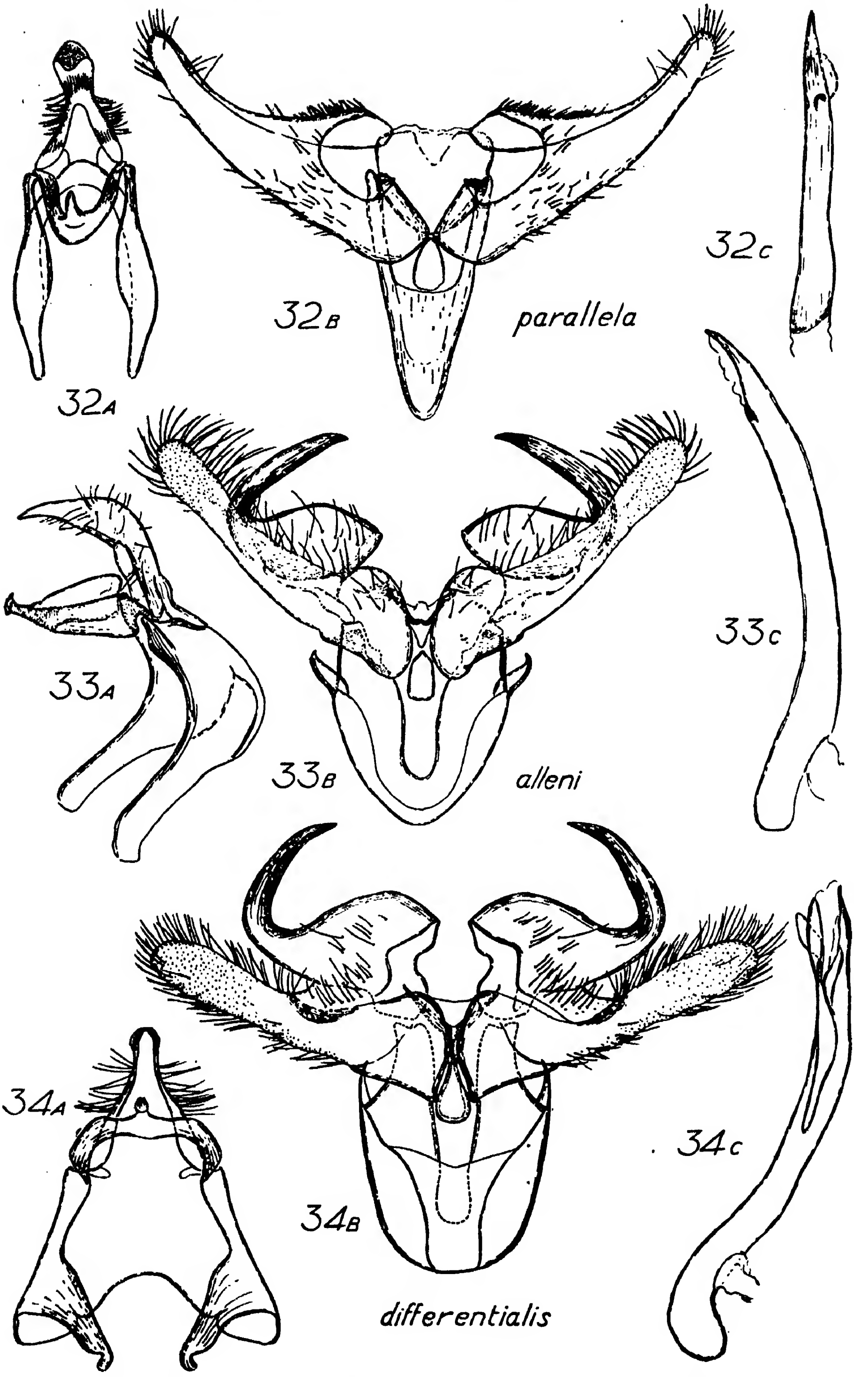


MALE GENITALIA OF DIATRAEA, DORATOPERAS, AND XANTHOPHERNE

FOR EXPLANATION OF PLATE SEE PAGE 45

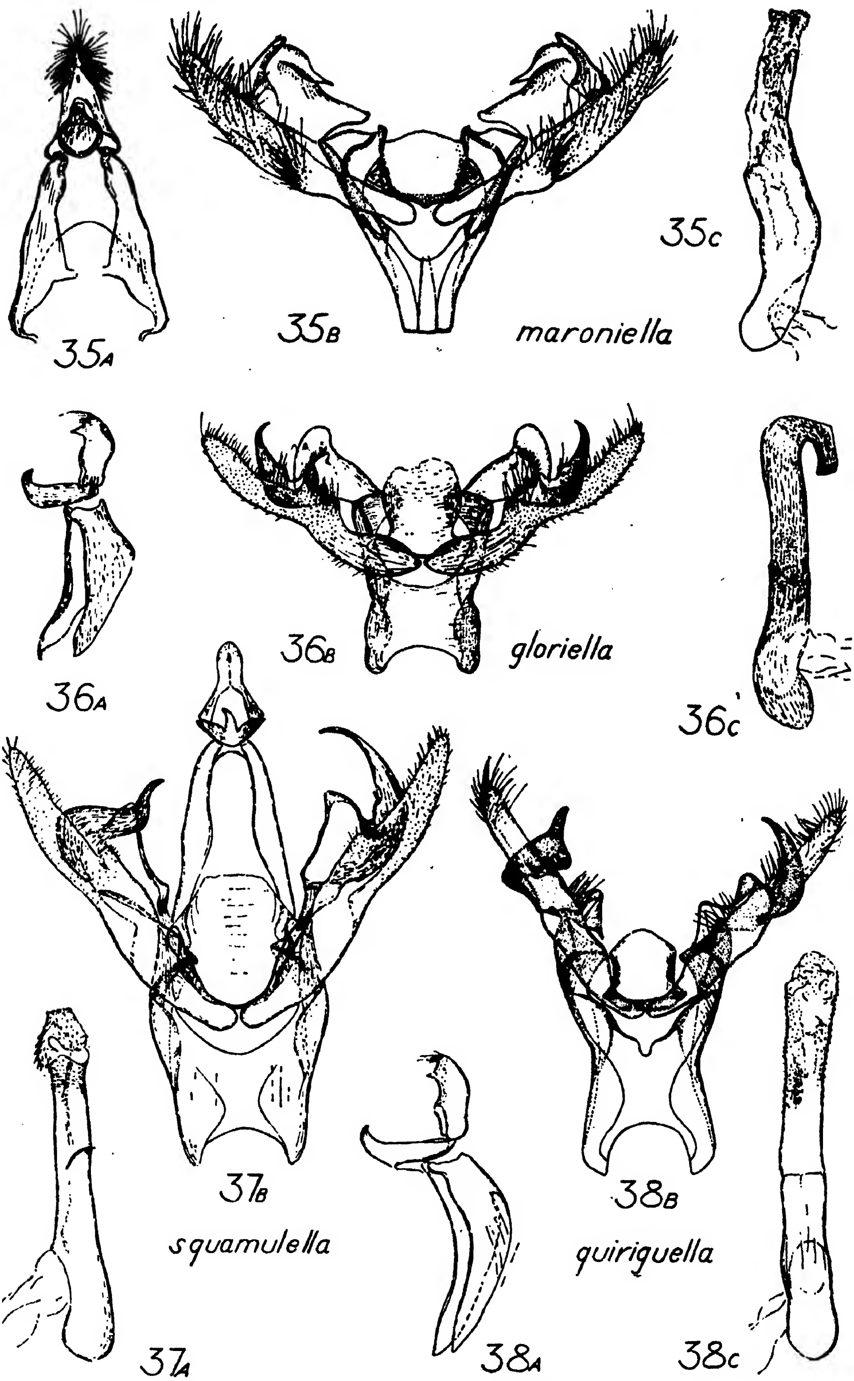


MALE GENITALIA OF IESTA, TRINIDADIA, HEMIPLATYTES, AND CHILO



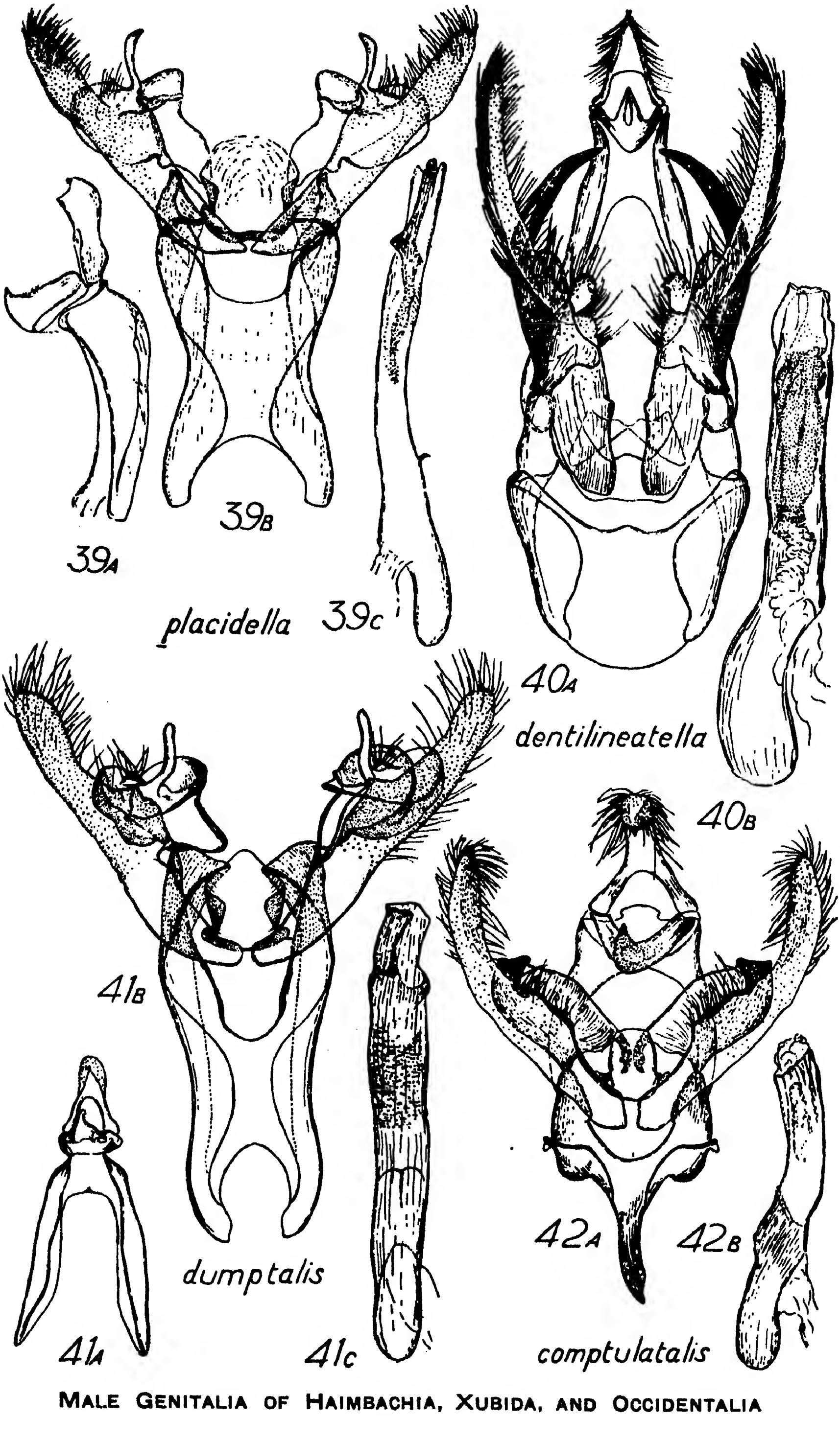
MALE GENITALIA OF ALAMOGORDIA, PLATYTES, AND DIATRAENOPSIS

FOR EXPLANATION OF PLATE SEE PAGE 46

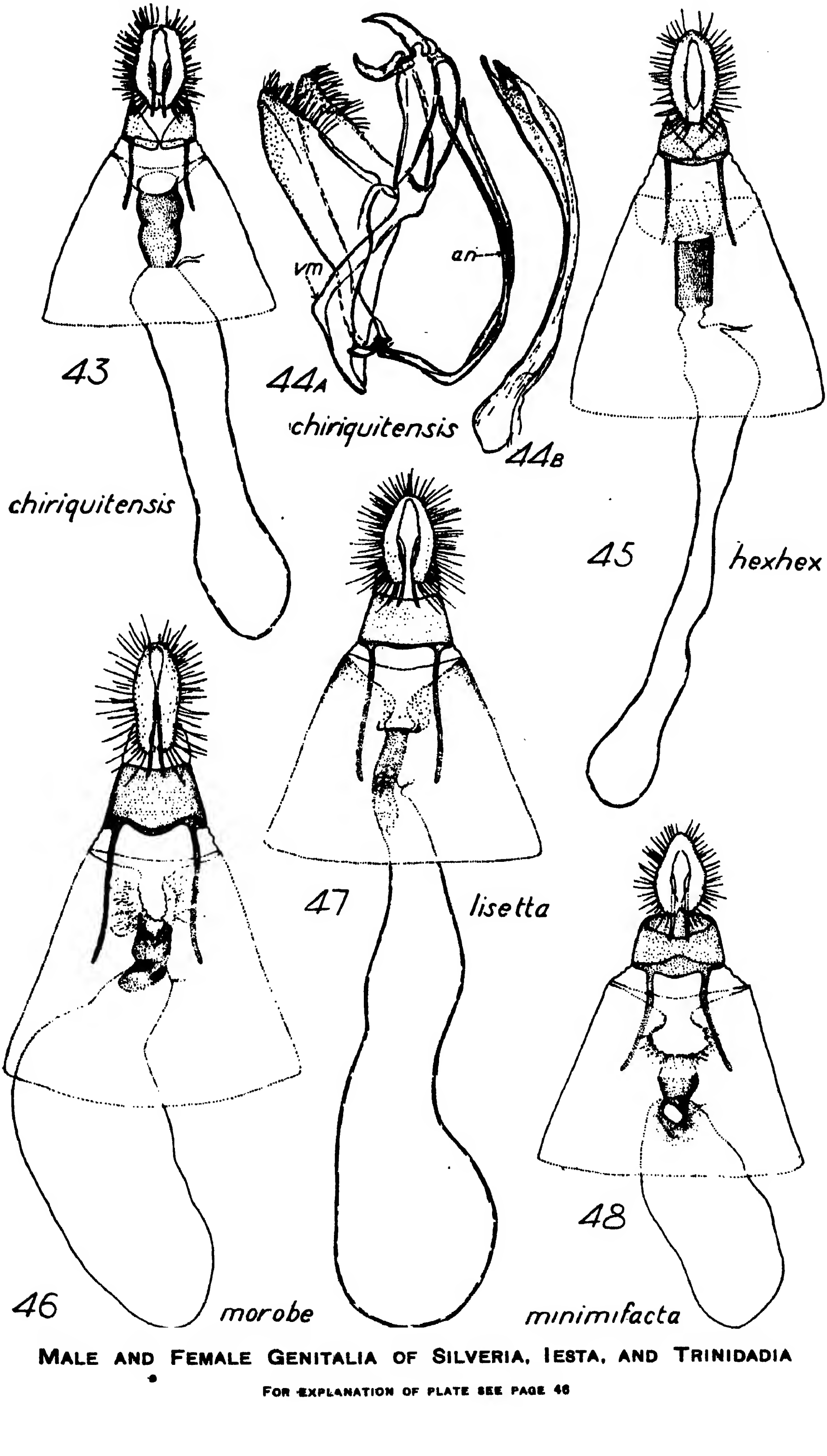


MALE GENITALIA OF HAIMBACHIA

FOR EXPLANATION OF PLATE SEE PAGE 46



MALE GENITALIA OF HAIMBACHIA, XUBIDA, AND OCCIDENTALIA



MALE AND FEMALE GENITALIA OF SILVERIA, IESTA, AND TRINIDADIA

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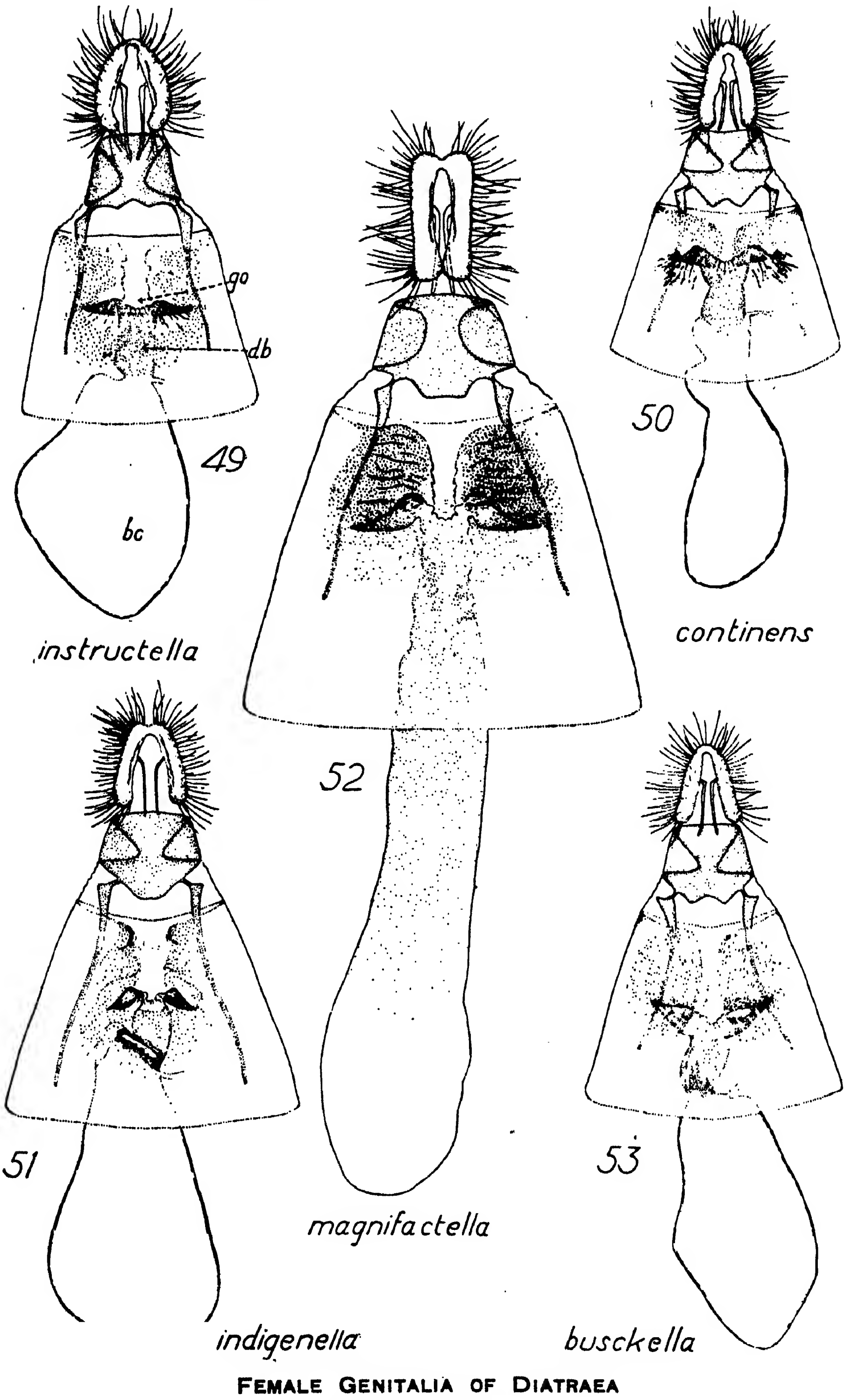
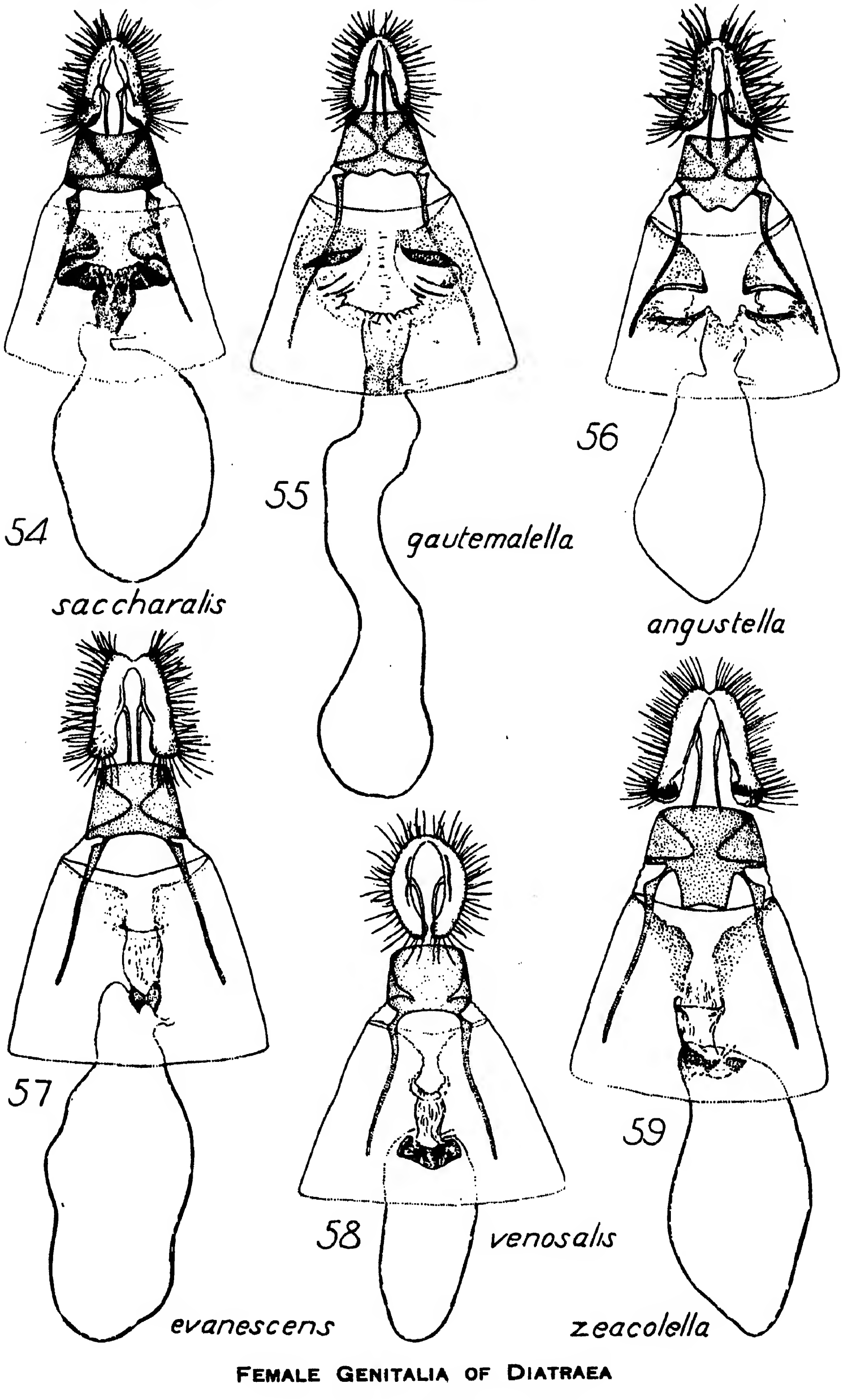


Female Genitalia of Diatraea

For explanation of plate see page 47



FEMALE GENITALIA OF DIATRAEA

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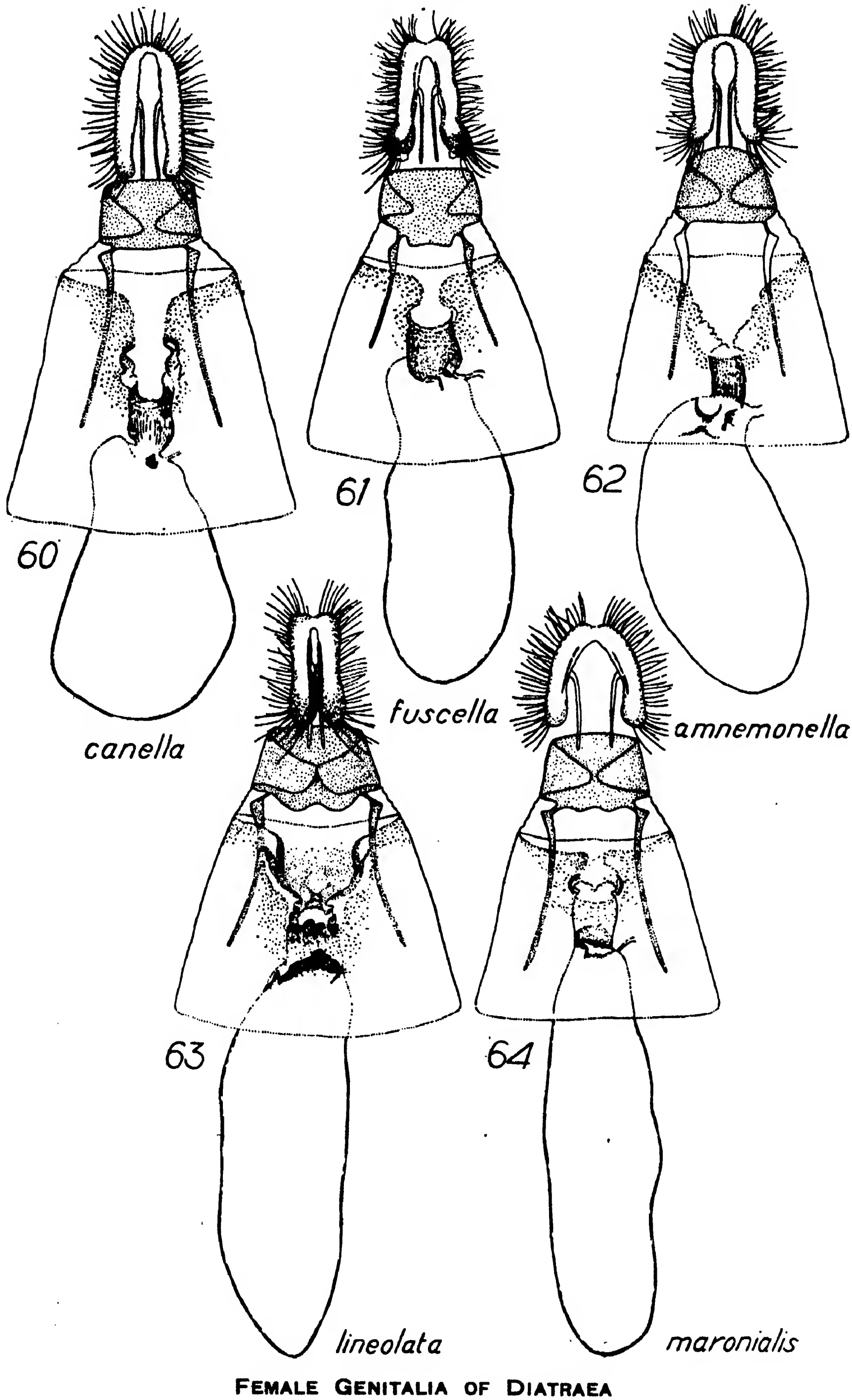

FEMALE GENITALIA OF DIATRAEA

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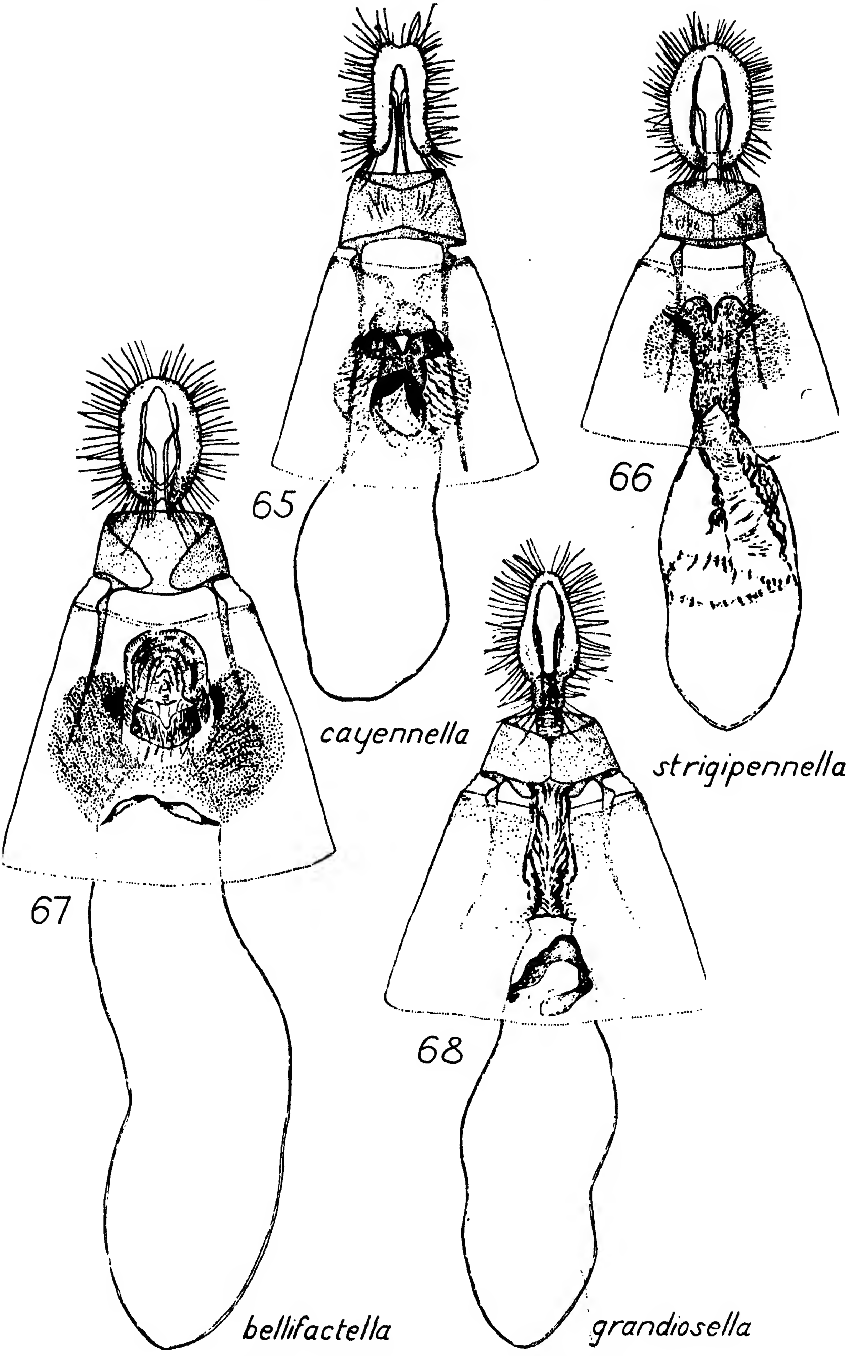

FEMALE GENITALIA OF DIATRAEA

FOR EXPLANATION OF PLATE SEE PAGE 47

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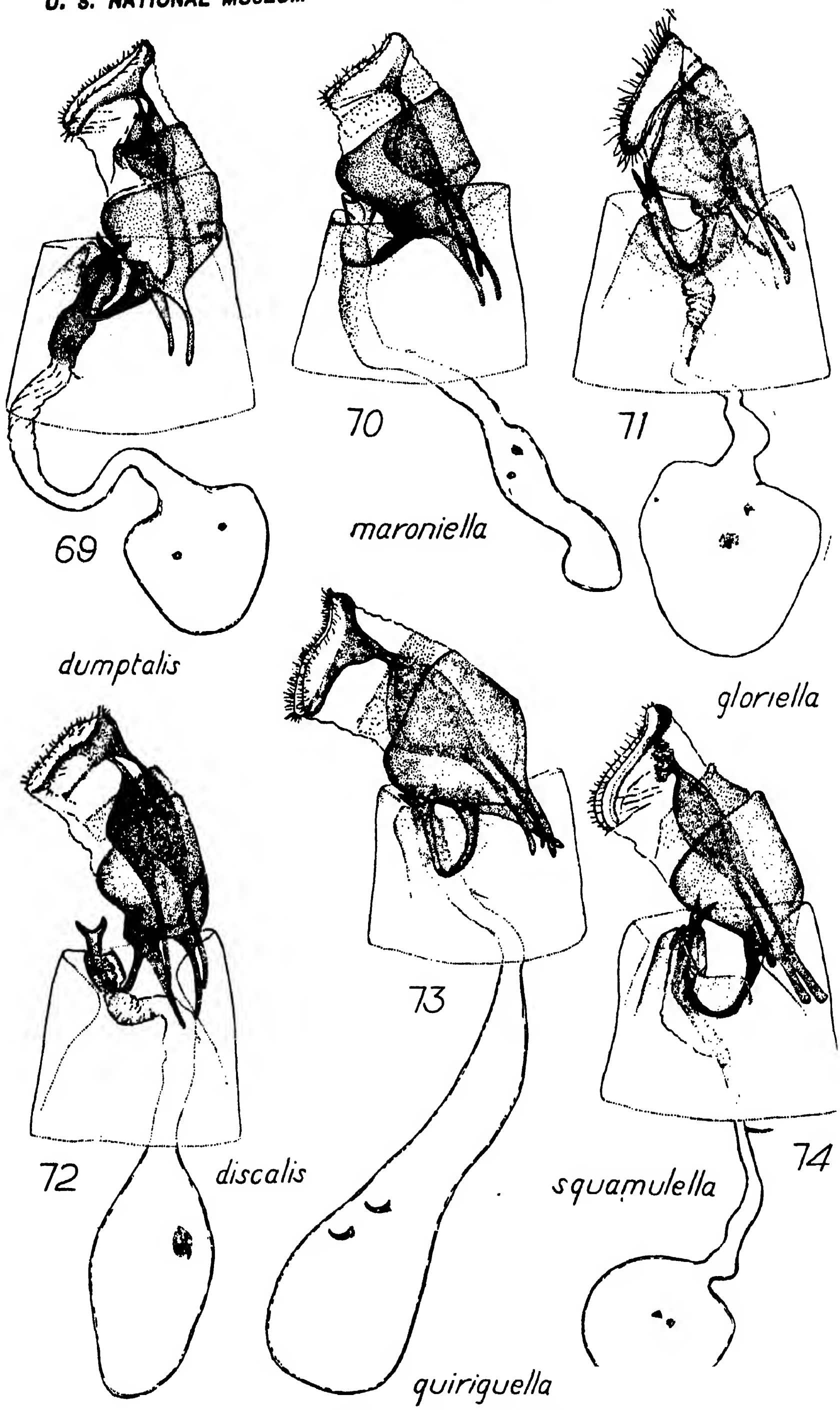
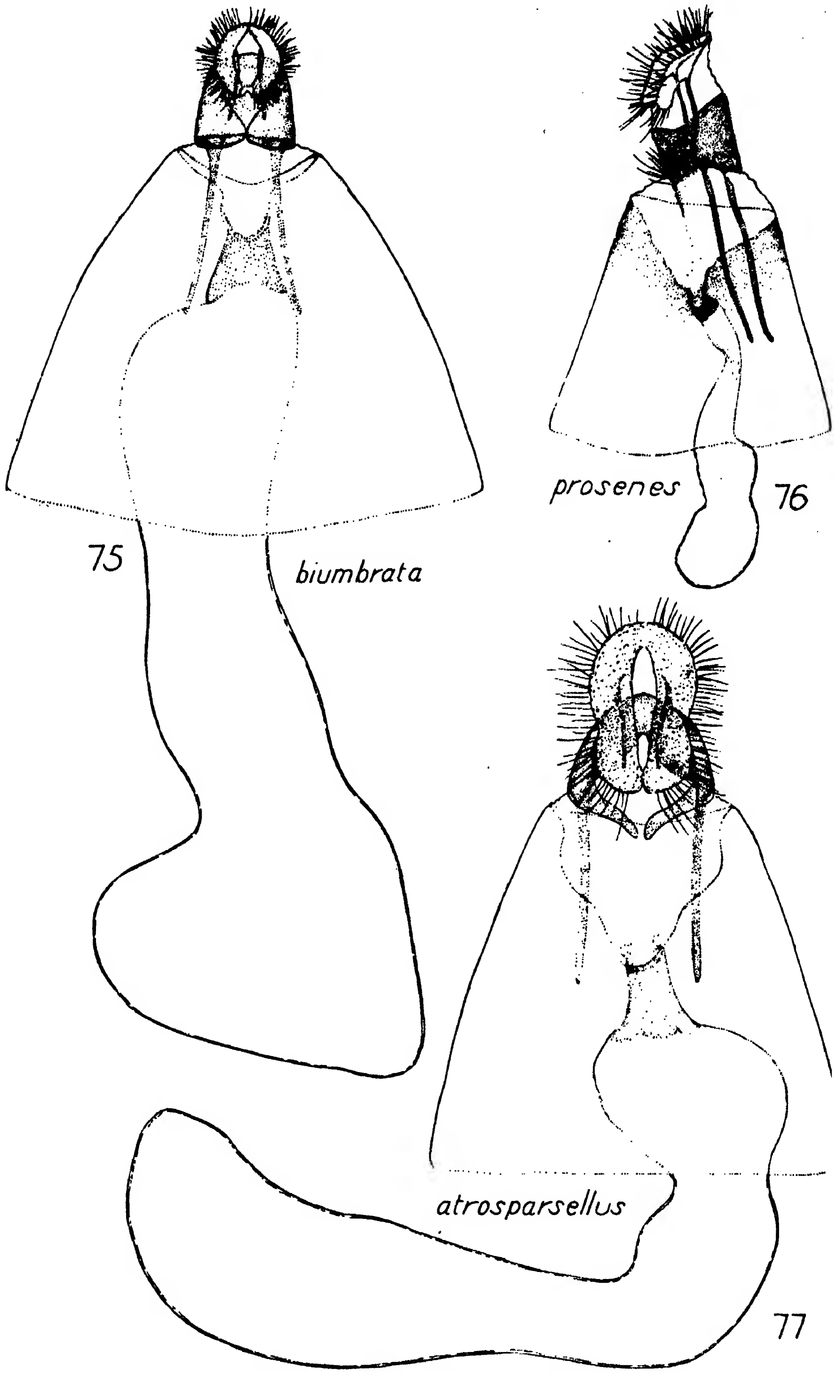
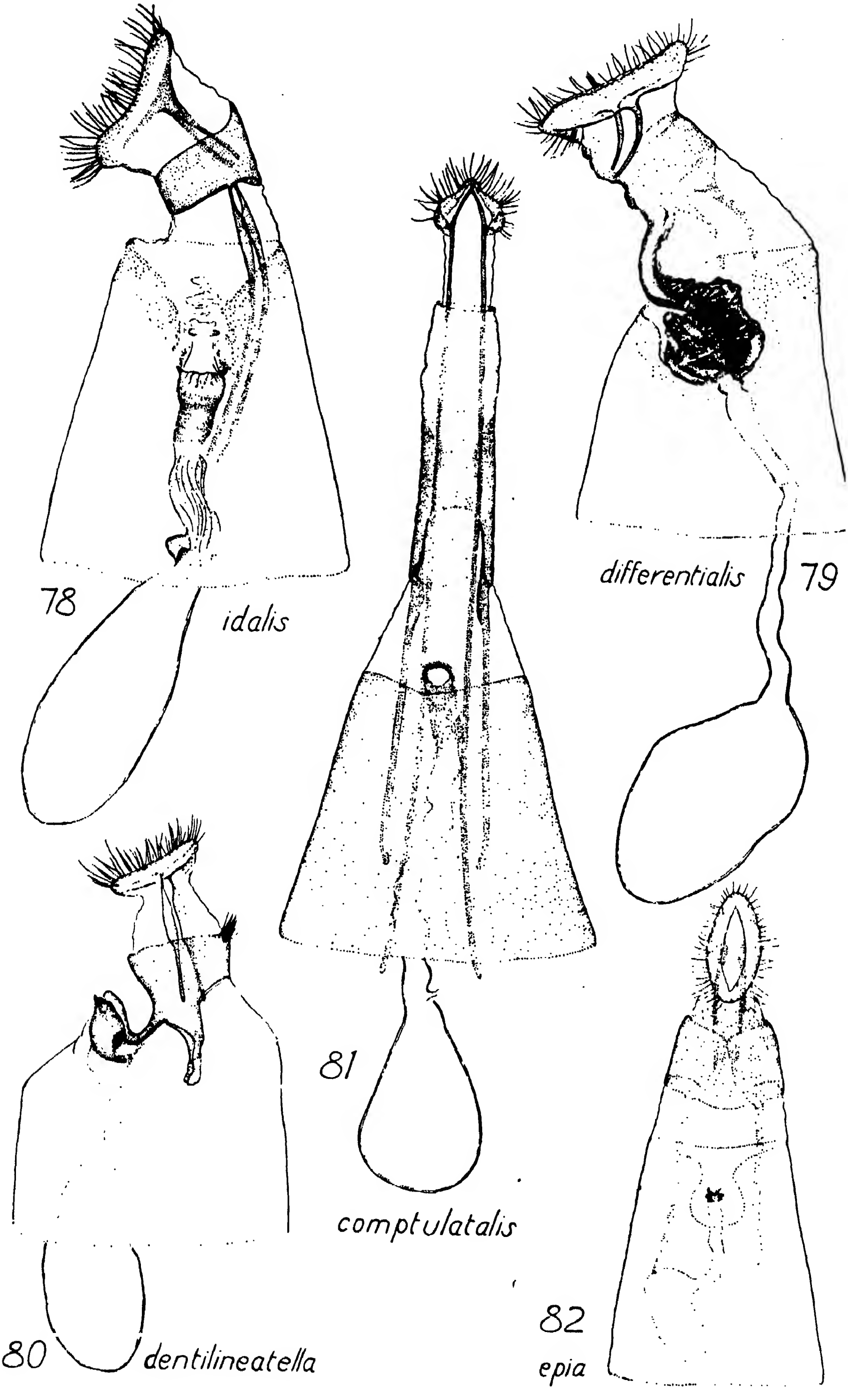


FEMALE GENITALIA OF HAIMBACHIA



FEMALE GENITALIA OF XANTHOPHERNE, HAIMBACHIA, AND DORATOPERAS

FOR EXPLANATION OF PLATE SEE PAGE 48



FEMALE GENITALIA OF DIATRAENOPSIS, XUBIDA, OCCIDENTALIA, AND HEMIPLATYTES

PYCNODESMA, A NEW MOLLUSCAN GENUS FROM THE SILURIAN OF ALASKA

By Edwin Kirk
Of the United States Geological Survey

Widely distributed in Alaska is a series of predominantly calcareous sediments that seems to represent a high upper Silurian horizon. It is known with certainty in the Seward Peninsula and in southeastern Alaska and probably is present in the upper Yukon Valley in the Fairbanks region. Fossils from this horizon have at various times been referred to the Devonian, Silurian, and even the Mesozoic, the latter tentative determination being made on the evidence of huge fragmentary pelecypods referable to *Pycnodesma*, the genus described in this paper.

The best section of this part of the upper Silurian in southeastern Alaska is on the south shore of Freshwater Bay, Chichagof Island. Here Middle Devonian rocks are found at each end of the section, and although it can not be told with certainty it appears that both contacts are due to faulting. Some miles northeast of this exposure, between False Bay and Iyoukeen Cove, is another faulted block of the upper portion of the series, bounded on the north by what is taken to be Middle Devonian and on the south by Mississippian. In Glacier Bay the isolated exposures of Willoughby and Drake Islands furnish the best collecting grounds for the fossils of the lower part of the series. The limestone appears elsewhere in the bay but as a rule is considerably metamorphosed. On the south shore of Kosciusko Island, off the west coast of Prince of Wales Island, *Pycnodesma* was collected but without the associated forms found elsewhere. It probably represents a somewhat earlier horizon than is present at the localities noted above.

This horizon represents the uppermost stratigraphic unit of the Silurian in southeastern Alaska and consists of approximately 3,000 feet of calcareous sediments. The basal portion of this series consists of some 1,200 feet of massive limestone, followed by 1,800 feet or more of argillaceous limestone with an occasional intercalated layer of greenstone. So far as known this series is underlain by

the limestones carrying the *Brooksina* fauna and is overlain by Middle Devonian. Within the series itself is found a fairly large and varied fauna, which ranges with considerable uniformity from top to bottom. Collections of fossils from the lower portion were made in Glacier Bay and in Freshwater Bay. The fauna of the upper half is chiefly known from the exposures in Freshwater Bay and along the shore between False Bay and Iyoukeen Cove. Among several unusual molluscan types the new pelecypod genus *Pycnodesma* is of particular interest and stratigraphic value.

PYCNODESMA, new genus

This huge pelecypod has a wide range in the Pacific coastal regions of Alaska. It has been found in Seward Peninsula and at various points in southeastern Alaska, including Glacier Bay, Freshwater Bay, Chichagof Island, and the south shore of Kosciusko Island. A pelecypod doubtfully referred to the genus has been collected on Quail Creek in the Rampart region, Alaska. An excellent series of specimens of this Alaskan pelecypod is now available for study. These specimens come in the main from Glacier Bay on the mainland and Freshwater Bay, Chichagof Island, both in southeastern Alaska. It is of interest to note that during the field season of 1926 sections of a large thick-shelled pelecypod were found in the high Middle Devonian near Gold Hill, Utah. The horizon is above one carrying *Stringocephalus*. The largest specimen seen had a height of approximately 10 centimeters. The thickness of the shell at the umbones and the structures indicating the presence of a large hinge ligament comparable to that of *Pycnodesma* suggest the possibility that the genus ranges up into the Devonian.

In the past this pelecypod has at various times been identified as *Megalomus*. Preparations of the Alaskan material and of typical *Megalomus* from the Guelph of Canada show that the Alaskan pelecypod is not referable to *Megalomus* but constitutes a new genus. Two species are here described, one coming from the massive limestones of Glacier Bay and the other from Freshwater Bay, Chichagof Island, in argillaceous limestone 1,000 feet or more stratigraphically above the Glacier Bay horizon. The pelecypod is an excellent horizon marker, as owing to its tremendously thick shell it can often be recognized in sections on weathered rock surfaces where metamorphism and shearing has destroyed other organic remains beyond the possibility of accurate determination.

Pycnodesma is notable in being perhaps the largest and most massive Paleozoic pelecypod. The individuals here figured are small to medium in size, as owing to the exigencies of collecting in Alaskan localities it was impossible to extract the larger specimens from the

massive limestone in which they were embedded. In Glacier Bay I have seen a section of *Pycnodesma giganteum* in the limestone measuring more than 12 inches (30 centimeters). This may or may not have been the greatest dimension of the individual. As noted under the description of *P. giganteum*, it is probable this is the height rather than the length of the individual in question. The shell itself is very massive. In the umbonal region a thickness of 2.5 centimeters (1 inch) is common, and shells having a thickness of nearly 5 centimeters (2 inches) have been seen. The shell becomes thinner toward the posterior and ventral margins but at all times is heavy. The surface is ornamented by low concentric growth lines. The lunule is small and inconspicuous. In *P. giganteum* there is a large well-marked escutcheon. The escutcheon is narrower and less conspicuous in *P. benjamini.*

The shell is obliquely ovate, with the greatest height in the posterior portion. The hinge line is short and straight except in its posterior part, where it flexes abruptly downward. The anterior margin is nearly straight or with a slight anterior flare in the ventral portion as viewed from the side and has approximately twice the length of the hinge. The ventral and posterior margins are smoothly and evenly curved. The greatest dimension of the shell is from the umbones to the posterior-ventral margin. There is no sharply defined umbonal ridge, but there is a smoothly rounded area of greatest convexity running from the umbones to the posterior-ventral margin. From this area the shell curves abruptly to the anterior margin, which is flattened or even incurved. To the dorsal margin the shell drops off less abruptly but more so than to the ventral and posterior margins. The umbones are highly arched and as noted elsewhere the shell is greatly thickened in this region. The beaks are relatively small and inconspicuous. They are sharply incurved toward the anterior end of the shell.

The hinge plate is massive and straight on the dorsal margin except in the extreme posterior portion, where it flexes abruptly downward. There are four or more massive, long, parallel cardinal teeth in each valve which lie at nearly right angles to the dorsal margin. There is always one well-defined posterior-lateral tooth which takes the form of a long narrow ridge, with a complementary groove on the opposite valve. In addition to this ridge there is a variable development of more or less amorphous interlocking structures of low relief. In the posterior portion of the hinge plate there may be two or more short ridges paralleling the downward flexed portion of the dominant posterior-lateral. These auxiliary teeth show particularly well in moderately young individuals. In large specimens, aside from the long lateral tooth, there is a variable development of lumps and ridges of low relief, with the complementary depres-

sions on the other valve. These are scattered more or less promiscuously along the posterior portion of the hinge plate.

Of great interest in the hinge structure of the genus and an outstanding structure differentiating it from the genera with which it might be confused is the presence of an unusually large opisthodetic ligament. This extends from the beaks to the posterior extremity of the hinge line. The ligament lies in a deep trough which as a rule is V-shaped in cross section. Specimens have been seen in which the dorsal margins of the shell are somewhat incurved, giving the ligamental fossa a suboval cross section. In moderately large specimens the trough in which the ligament lies has a depth of about 1 centimeter, while in a large fragmentary specimen it has a depth of more than 2 centimeters. The walls of the fossa are striated longitudinally.

The posterior muscle scar is inconspicuous but appears to be fairly large and situated high up in the valve below the posterior end of the hinge. The anterior muscle is relatively small and varies in size in individuals of approximately the same size. The scar is deeply impressed and lies at the lower anterior extremity of the hinge plate, closely apposed to the group of anterior teeth. The pallial line is simple. No pedal scar has been identified.

Pycnodesma may well be referred to the Megalodontidae. In this family there are but two genera with which *Pycnodesma* need be compared—*Megalomus* and *Megalodon*. *Megalodon* is thoroughly known, but the structure of *Megalomus* has never adequately been figured and described. The figure given by Hall [1] is inadequate and somewhat misleading. *Megalomus* and *Megalodon* are intimately related and may only be separated on minor structural features.

Pycnodesma may readily be distinguished from *Megalodon* and *Mewalomus*, figures of which may be seen on Plate 2, Figures 6 and 7. An outstanding character is the enormous development of the ligament in *Pycnodesma*. The hinge plate in *Megalodon* and *Megalomus* is a massive anteriorly situated platform sharply cut off from other shell structures and extending backward as an attenuated strip. In *Pycnodesma* the hinge plate is a broad, well-defined structure extending to the posterior end of the hinge. The cardinal teeth in *Pycnodesma* are more numerous and less massive than in *Megalodon*. In *Pycnodesma* they are subequal in size, fairly straight and parallel. In *Megalodon* and *Megalomus* the cardinal teeth are of variable form and variously curved and oriented. In *Pycnodesma* the teeth lie at approximately right angles to the hinge, while in *Megalodon* they are subparallel to it. This feature as

[1] Hall, James, Paleontology of New York, vol. 5, pt. 1 (2), pl. 52.

well as the relative position of the anterior adductor is, of course, determined by the very different degree of torsion in the shells. In *Pycnodesma* there appears to be no pedal scar, which is present in both *Megalodon* and *Megalomus*. In *Pycnodesma* the beaks are much smaller and less conspicuous, the hinge line shorter and the anterior margin longer, all of which give the genus a general aspect quite at variance with *Megalodon* and *Megalomus*.

As genotype, *Pycnodesma giganteum*, new species, has been chosen. The genus as yet is known only from the high upper Silurian strata of Alaska but doubtless will be found in Asiatic faunas of equivalent age.

PYCNODESMA GIGANTEUM, new species

This species is found in great abundance in the massive Silurian limestone of Glacier Bay, notably on Willoughby and Drake Islands. It is also probably the species found in the Silurian limestone of Seward Peninsula and in the massive limestone at the base of the Silurian section in Freshwater Bay, Chichagof Island.

Extremely large specimens of the species are often seen. On Drake Island, Glacier Bay, I saw a weathered cross section of an individual measuring more than 12 inches (30 centimeters). Judging by the thickness of the shell it is probable that this section did not lie along the line of greatest length but gave the approximate height of the shell. The specimens here figured are of small to medium size, as it was not possible to collect the largest specimens in other than a fragmentary condition.

The shell is obliquely ovate, with the greatest height in the posterior portion. The longest dimension of the shell is an oblique line from the beaks to the posterior-ventral margin. In a small individual, reasonably well preserved, the following measurements obtain: Straight portion of hinge, 2 centimeters; total length of hinge, about 3 centimeters; anterior margin, 4.5 centimeters; height, 6+ centimeters; and greatest length, 7+ centimeters. The greatest transverse dimension of this individual is 4 centimeters. These relative proportions seem approximately to hold in the larger specimens.

The hinge line is short and straight except in its posterior portion where it flexes abruptly downward, meeting and merging with the smoothly and evenly curved posterior margin. The anterior margin is straight and at approximately right angles to the hinge line, or forms an acute angle with it. The ventral margin is relatively short and smoothly curved. The valves are highly ventricose. The umbonal region is prominent and highly arched. The beaks proper are small and sharply incurved. The valve is most highly arched along a line running obliquely from the umbones to the posterior-ventral margin. From this line the shell pitches rather abruptly to the anterior and

dorsal margins. In all other directions the slope is more gradual. As shown in an anterior view, the anterior portion of the shell is decidedly flattened. Along the line of contact of the valves is a well-marked depression due to a decided incurving of the valves along their anterior margins.

The shell itself is very thick, especially in the umbonal region and along the line of greatest arching. In the umbonal region of large individuals the shell may be 5 centimeters (2 inches) or more in thickness, while specimens of medium size have a thickness of an inch or more in this part of the shell. The shell becomes thinner toward the margins but at all times is heavy. The surface of the shell is marked by fine concentric lines, which become much coarser in the flattened anterior portion of the valves. An inconspicuous lunule and a large, well-defined escutcheon are present.

The hinge plate is very broad in the anterior portion of the valve, narrowing posteriorly and then becoming wider again. In its posterior part it flexes abruptly downward. The anterior teeth are five or six in number in each valve and are usually subequal in size. They are long, nearly straight, narrow and parallel. They lie at nearly right angles to the hinge or slope somewhat posteriorly. Rarely two of the teeth partially fuse laterally, giving the effect of fewer, more massive teeth, as shown in Plate 1, Figure 4. This appears to be an individual variation and is only partially to be correlated with ontogenetic change. In the posterior portion of the hinge plate is a variable development of posterior-lateral teeth. Usually there is one well-defined tooth which shows as a low narrow ridge. This may start near the group of anterior teeth or much farther back on the hinge plate. Always it appears to be present in the downward flexed portion of the hinge plate. In addition to this long narrow posterior-lateral there may or may not be present one or more linear, short, more massive teeth, usually restricted to the downward flexed portion of the plate but occasionally anterior to the flexure. In addition to these fairly well-defined teeth there is a variable development of amorphous elevations and depressions posterior to the group of anterior teeth.

The anterior muscle scar lies at the lower anterior angle of the group of anterior teeth. In all but one specimen seen the scar lies in a small inconspicuous pit. In this one exception (pl. 2, fig. 5) the muscle scar is far larger than in any other specimen observed, irrespective of size, and may be an individual abnormality. Possibly the specimen is referable to another species. It is to be noted that the specimen is referred to this species with a question, as it has other characters, such as a longer hinge line, more projecting anterior portion of the shell, and more pronounced surface sculpture than

is characteristic of the typical specimens of the species. The posterior muscle scar is very poorly known, as the posterior portion of the shell is usually broken away, and only indifferent internal molds of the shell are available for study. The posterior muscle appears to have been large and situated high up on the shell, below the posterior end of the hinge.

The type specimens were collected in the massive upper Silurian limestones of Drake and Willoughby Islands, Glacier Bay, southeastern Alaska. Collector, E. Kirk.

Cotypes.—Cat. No. 71275, U.S.N.M.

PYCNODESMA BENJAMINI, new species

This species is common in the upper portion of the upper Silurian section as exposed in Freshwater Bay, Chicagof Island, southeastern Alaska. Occurring as it does in argillaceous limestone which is much checked and fractured it is, however, difficult to secure reasonably perfect specimens. Enough material was seen and collected, however, to prove that the form is specifically distinct from *Pycnodesma giganteum* which is found 1,000 feet or more stratigraphically lower in the section.

The species, though of large size, apparently does not reach the great dimensions of *Pycnodesma giganteum.* Unfortunately no individual has all the margins sufficiently well preserved to get the relative proportions of the shell and thereby estimate the maximum dimensions of large fragmentary specimens.

In general outline the shell appears to be subquadrate, with the height somewhat in excess of the length, and with the greatest dimension the line running from the beak to the posterior-ventral border. The general slope of the shell is very different from *Pycnodesma giganteum.* The hinge is proportionally longer, as is the anterior margin. The anterior margin of *P. giganteum* is at approximately right angles to the hinge line or forms an acute angle with it. In *P. benjamini* the anterior margin carries forward, making a decided obtuse angle with the hinge line.

The hinge line as noted above is proportionally longer than in *P. giganteum.* In its posterior portion it curves gently downward instead of being sharply flexed. The anterior margin is straight in its upper portion, but ventrad it flares outward. The valves are much less ventricose than in *P. giganteum.* The umbonal region is the most highly arched portion of the shell. The beaks are small and incurved. The valves are most highly arched along a line running from the beaks to the posterior-ventral margin, but this arched area is not sharply differentiated from the remainder of the valve. Toward the anterior margin the shell pitches off rather abruptly, particularly in the dorsal part. In all other directions the shell

slopes off gradually. The anterior portion of the shell is slightly flattened in its upper part but not so decidely as in *P. giganteum*, nor is there the incurving of the valves as in the latter species.

The shell itself is relatively thinner than in *P. giganteum*. As in that species the thickest portion of the shell is at the umbones, and continuing backward and downward along the line of greatest convexity. The surface of the shell is marked by fine concentric growth lines. The lunule is small and the escutcheon narrow and relatively inconspicuous.

The internal shell structures are inadequately known owing to the poor preservation of the material. The hinge plate is proportionally longer than in *P. giganteum* and straighter. The anterior teeth seem to be similar in all respects to those of *P. giganteum*, as is the anterior muscle scar. The posterior teeth and muscle scar are unknown.

The species may readily be distinguished from *P. giganteum*. It has a thinner shell. The beaks are more prominent owing to the fact that the umbones are less highly arched. The valves are less highly arched than in *P. giganteum*, giving a much narrower shell. The most striking difference is the general outline. The obtuse angle formed by the anterior margin with the hinge line and outward flare of the lower portion of the anterior margin is a very striking feature. The relatively longer and straighter hinge line is also characteristic.

The specific name is given in honor of Dr. Marcus Benjamin, of the United States National Museum.

Pycnodesma benjamini was collected in the upper portion of the upper Silurian section on the south side of Freshwater Bay, Chichagof Island, southeastern Alaska, near the head of the bay. Collector, E. Kirk.

Holotype.—Cat. No. 71276, U.S.N.M.

EXPLANATION OF PLATES

PLATE 1

Pycnodesma giganteum, new species

FIG. 1. Anterior view.
2. Dorsal view of same specimen.
3. Exterior, left valve of same specimen.
4. Interior, left valve of same specimen.
5. View of right side of another specimen showing almost complete outline. Cat. No. 71275, U.S.N.M.

Pycnodesma giganteum, new species?

6. Portion of right valve of a specimen showing growth lines. Cat. No. 71277, U.S.N.M.

All figures approximately × 2/3.

PLATE 2

Pycnodesma benjamini, new species

FIG. 1. View of right side of the type specimen. Cat. No. 71276, U.S.N.M.
2. Anterior view of same specimen.

Pycnodesma giganteum, new species

3. Interior of left valve showing posterior portion of hinge plate.
4. Interior of right valve of another specimen showing anterior portion of hinge plate, teeth, and small muscle scar. Cat. No. 71275, U.S.N.M.

Pycnodesma giganteum, new species?

5. Interior of right valve of same specimen figured as Pl. 1, fig. 6, showing striated wall of ligamental fossa, teeth, and large muscle scar. Cat. No. 71277, U.S.N.M.

Megalodon (*Eumegalodon*) *cucullatus* (Goldfuss)

6. Interior view of left valve.
Middle Devonian, Paffrath, near Cologne, Germany. Cat. No. 15527, U.S.N.M.

Megalomus canadensis Hall

7. Interior view of right valve.
Guelph (middle Silurian), Elora, Ontario. Cat. No. 71278, U.S.N.M.

All figures approximately × 2/3.

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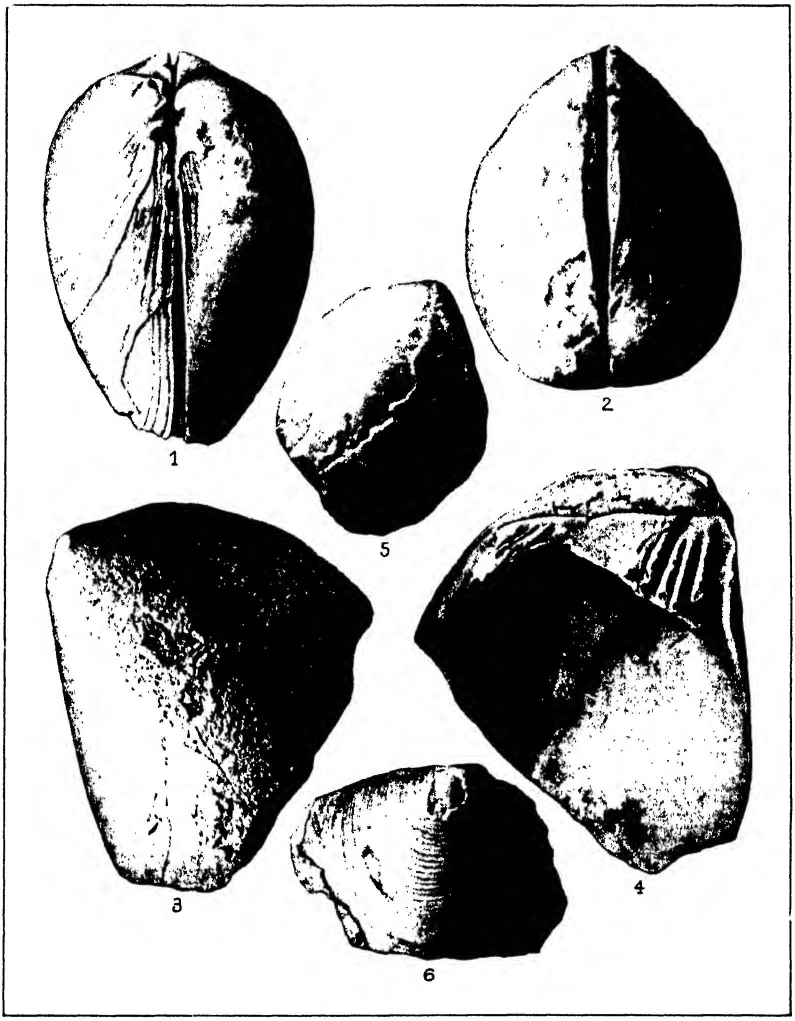
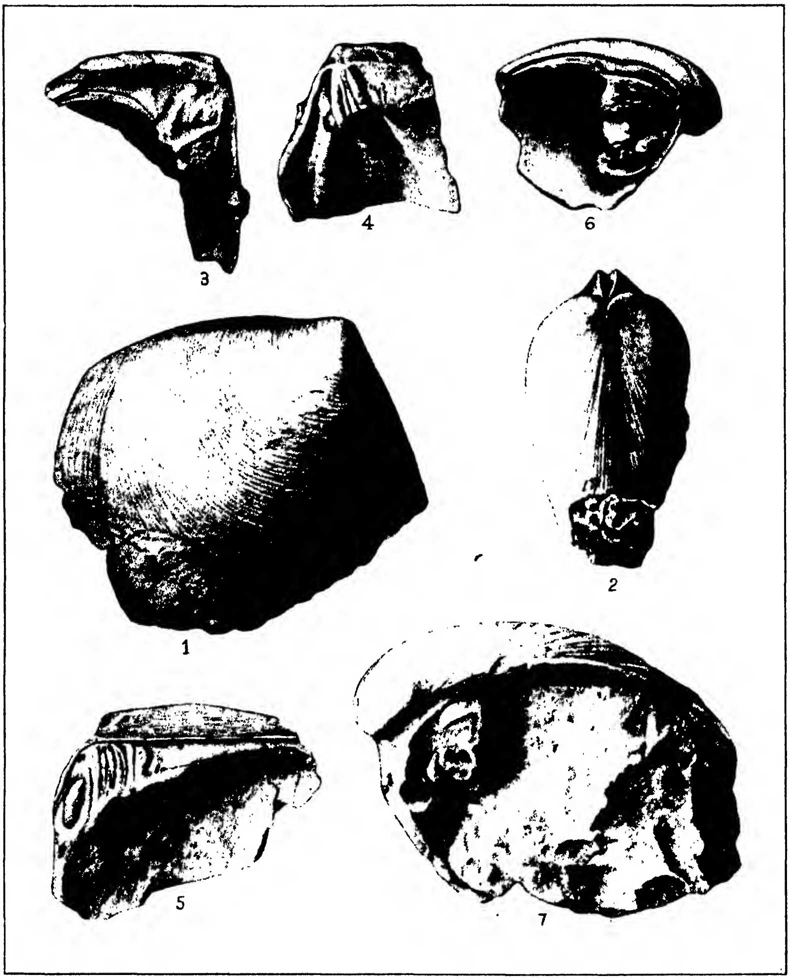


VIEWS OF PYCNODESMA GIGANTEUM, NEW SPECIES

FOR EXPLANATION OF PLATE SEE PAGE 8



PYCNODESMA BENJAMINI, P. GIGANTEUM, MEGALODON CUCULLATUS AND MEGALOMUS CANADENSIS

FOR EXPLANATION OF PLATE SEE PAGE 9

A RECENTLY FOUND IRON METEORITE FROM OAKLEY, IDAHO [1]

By George P. Merrill

Head Curator of Geology, United States National Museum

My attention was first called to the finding of this iron by a clipping from the Salt Lake Tribune of May 13, 1926, forwarded by Mr. Victor C. Heikes of the Bureau of Mines. It read as follows:

> Oakley, Idaho, May 12. At the Idaho Power Co.'s offices here a small meteorite discovered in the hills a few miles east of Oakley, is on exhibition.
>
> It is about the size of a cowboy hat and weighs 260 pounds.
>
> In color it is of a light brown and in general appearance it resembles a piece of conglomerate rock. However, in substance it is a very peculiar character formation of iron and steel, hard as flint, bidding defiance to file or chisel and has the ring of very fine metal.

A letter to the power company asking that the iron be sent on to Washington for examination brought the following reply, which constitutes all that can be learned regarding the finding of it.

> August 14, 1926.
>
> Inclosed please find B. L. covering meteor which has been sent as per your request.
>
> In regard to the finding and location and so forth, the meteorite was found about 10 miles northeast of Oakley, Cassia County, Idaho, on the west side of Mount Harrison. The actual finding was made by Lawrence Elliott, age 14, and Burton Mackey, age 16. These two boys were cutting cedar posts and one of them hit the meteor with his axe, which gave off a ringing sound, and they then made further investigation which proved to be a meteor.
>
> As to its possibility of having been seen when falling, two parties state that they saw something of this kind fall about 15 years ago and in the middle of the winter, but as to this having any bearing on the meteor would be a question.
>
> Yours very truly,
>
> Charles Elliott.

The form of the iron (see pls. 1 and 2) was such as to excite interest, and steps, which proved successful, were at once taken to secure it for the national collections, where it now rests.

[1] Catalogue No. 780.

The dimensions of the mass are 50 cm. in width (C–D) and 50.3 cm. in height (A–B) as figured in plate 1. The maximum thickness (F–E, pl. 2) is 21.5 cm.; weight [redacted] kilograms. With it was a fragment which had been broken from the edge weighing 420 grams, which brings the total weight received to [redacted] kilograms. An estimate that at least a kilogram had been broken away and not received, places the original weight at approximately [redacted] kilograms.

As noted, the form of the iron is such as to excite interest (see pls. 1 and 2). From a maximum thickness at the point (E) it bevels out gradually in directions toward the left and top—in the figure—to knife edges; to the right and toward the bottom the sloping is abrupt. The shape is such as to suggest a rough quarter section of an original discoidal mass, convex above and concave beneath and thickest in the center, which has been broken out so as to include a considerable part of the original central portion. That the point (E) represents the nose, or *brustseite*, is self-evident as is the fact shown by the sculpturings that it has traveled some little distance in this position. The finer sculpturings, if such they were, have become obliterated through oxidation, as have also any signs of the flowing back over the edges of molten material. The sculpturings on the lower surface (fig. 2, pl. 1) are large and of sufficient depth to cause a considerable concavity.

An etched surface on the edge of the fragment from point (C) shows the iron to be a coarse octahedrite of no unusual features. The composition, as shown by Earl V. Shannon's analysis below, is also devoid of any unusual features unless absence of chromium, platinum, and manganese be so considered.

A portion of 10.5746 grams, free from scale, was used by Mr. Shannon for the analysis. The method, with minor variations, was the same as that used for the Odessa iron and described in detail in that report.[2] The composition of the Oakley is as follows:

Insoluble	0.004
Iron (Fe)	92.374
Nickel (Ni)	7.038
Cobalt (CO)	.273
Manganese (Mn)	None.
Platinum (Pt)	None.
Phosphorus (P)	.280
Copper (Cu)	.006
Chromium (Cr)	None.
Sulphur (S)	.016
Total	99.991

The almost unweighable amount of insoluble material was examined microscopically. It seemed to consist of a few grains

[2] Amer. Jour. Sci., vol. 3, May, 1922, p. 336.

of quartz sand, possibly derived from the grinding wheel. No graphite, chromite, or diamonds were present.

The form of the iron, it will be noted, is strikingly like that of Cabin Creek[3] and leads one to speculate on the possibility of its being but a portion of a scale-like fragment torn from a larger mass after entering our atmosphere.

EXPLANATION OF PLATES

PLATE 1. Front and rear views. Nose or *brustseite* at E in upper figure. Dimensions A–B, 50 cm., C–D, 50.3 cm. Broken edge at C

PLATE 2.—Side view. Lettering A, B, and E as in Plate 1. Maximum thickness F–E, 21.5 cm.

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[3] Amer. Journ. Sci., vol. 33, June, 1887, pp. 494–499, pl. 13.

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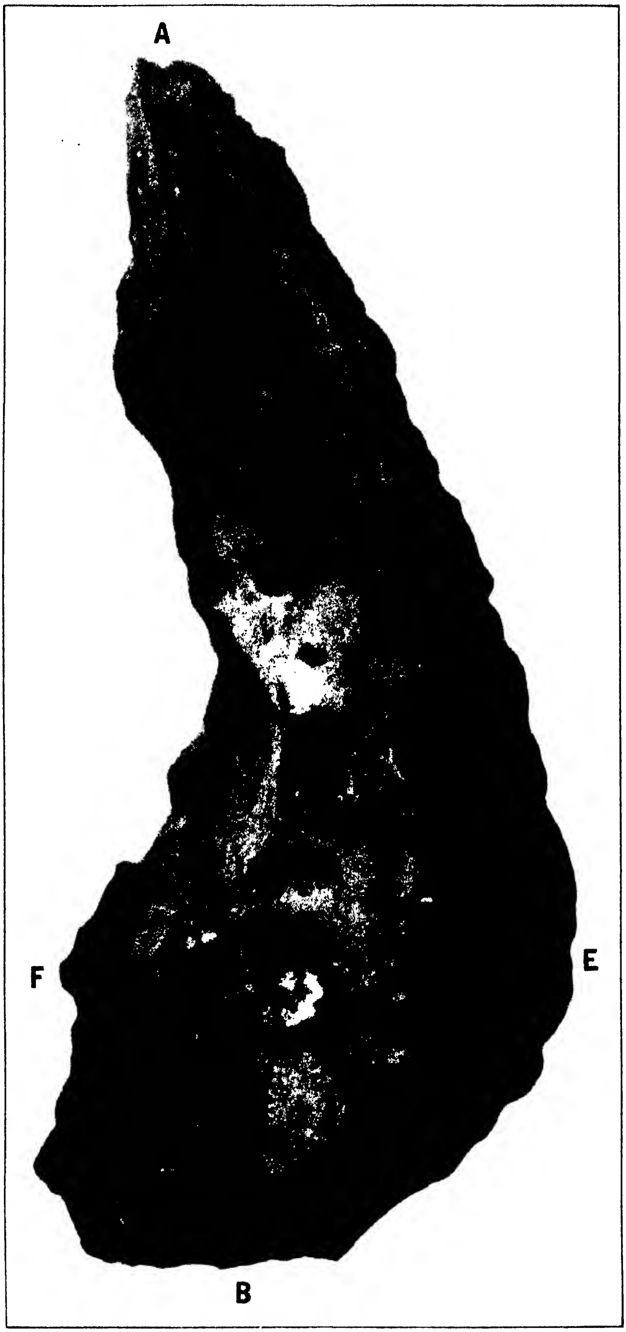
OAKLEY (IDAHO) METEORIC IRON

FOR EXPLANATION OF PLATE SEE PAGE 3



METEORIC IRON FROM OAKLEY, IDAHO

FOR EXPLANATION OF PLATE SEE PAGE 3

A NEW NEMATODE, NEMATODIRUS ANTILOCAPRAE, FROM THE PRONG-HORN ANTELOPE, WITH A KEY TO THE SPECIES OF NEMATODIRUS

By Emmett W. Price

Associate Parasitologist, Zoological Division, Bureau of Animal Industry, United States Department of Agriculture

The nematode described in this paper was collected by the writer from the small intestine of a prong-horn antelope *Antilocapra americana* which died in the National Zoological Park, Washington, D. C. This animal, a recent accession, was obtained from the western part of the United States. In view of the fact that wild ruminants often serve as hosts for certain parasites of domestic animals, it is not unlikely that this nematode may also occur in cattle, sheep, or goats in certain parts of this country.

This nematode belongs to the genus *Nematodirus* Ransom, 1907, but it possesses characters which differ from those of any existing species of the genus. It is therefore considered as new and the name *Nematodirus antilocaprae* is hereby proposed.

NEMATODIRUS ANTILOCAPRAE, new species

Diagnosis.—*Nematodirus.*—Characters of the genus.

Body long and slender, pink in color when fresh, and gradually tapering toward the anterior extremity. The cuticle of the head is inflated asymmetrically, but no striations appear to be present. Circumoral papillae present. Cervical papillae not apparent. The excretory pore is situated at the junction of the esophagus and intestine. The esophagus measures about 450 to 495μ in length.

Male 13 to 16 mm. long and with a maximum thickness of about 140μ. The bursa (figs. 1 and 2) is composed of two large lateral lobes and a smaller dorsal lobe. The dorsal lobe is set off from the lateral lobes by moderately deep indentations. A deep median in-

dentation is present which divides it into two smaller lobes which are supported by the two dorsal rays. These rays are bifurcated near the tip, the lateral branch being slightly longer than the median. The externo-dorsal rays are quite widely separated from the other rays, slender and curved slightly dorsad. The postero-lateral and medio-lateral rays are long, slender, and parallel except near their tips where they diverge slightly and terminate near the edge of the bursa. The externo-lateral ray arises from the same common stem with the medio-lateral and postero-lateral rays; it runs parallel to the medio-lateral ray for about one-half of its length and then bends ventrad at almost a right angle. The ventral rays diverge slightly near their tips and terminate near the edge of the bursa. Bursal maculae or bosses appear to be absent. The spicules are long and measure 4.1 to 4.4 mm. They are united for the greater part of their length. The tip is straight and semilanceolate. (Fig. 3.)

Female 24 to 29 mm. long and with a maximum thickness at the vulva of about 250μ to 350μ. The body thickness is noticeably reduced immediately behind the vulva. The tip of the tail is truncate and bears an acutely pointed bristlelike process 14μ in length. (Fig. 4.) The anus is located 100μ to 115μ from the truncate tip of the tail. The vulva is a transverse slit situated about 1 mm. anterior to the middle of the body. The ovejectors are long, the combined length being about 4 mm. The posterior ovejector measures about 2.5 mm. and the anterior about 1.5 mm. in length. The anterior uterus is atrophied and appears to be sterile. The eggs are oval, with shells of uniform thickness, and measure 240μ long and 130μ wide.

Host.—Antilocapra americana.

Location.—Small intestine.

Locality collected.—National Zoological Park, Washington, D. C.

Type specimens.—United States National Museum Helminthological Collections No. 27438.

This species belongs in the *N. mauritanicus* group as described by May (1920). It is quite similar to *N. mauritanicus*, which was described by Maupas and Seurat (1912) from the dromedary, but differs from this species in location of vulva and position of uteri. In *N. mauritanicus* the vulva is located about 4 mm. posterior to the middle of the body and both uteri are directed backward, while in *N. antilocaprae* the vulva is about 1 mm. anterior to the middle of the body and one uterus lies in the anterior and the other in the posterior part of the body. Maupas and Seurat do not state whether both uteri in their species are functional or not. Their figure, however, suggests that possibly one may be sterile. The atrophied condition of the anterior uterus in *N. antilocaprae* relates it to *N.*

dromedarii. In the latter species the vulva is located at the junction of the anterior and middle thirds of the body and the spicules of the male are considerably longer.

The genus *Nematodirus* at the present time contains 14 species, and for convenience in making determinations the following key is appended.

KEY TO THE SPECIES OF NEMATODIRUS

1. Female less than 8 mm. long; vulva 1.57 mm. from posterior end; male not known; in monkey (*Anthropopithecus troglodytes*) ---------- **N. weinbergi.**
   Female more than 8 mm. long ---------- 2
2. Spicules less than 2 mm. long ---------- 3
   Spicules more than 2 mm. long ---------- 10
3. Spicules 0.430 mm. in length, the proximal portion of uniform diameter and terminal portion pointed; this terminal attenuated portion resembles an interrogation mark; in hippotamus ---------- **N. hopkeni.**
   Spicules not so shaped ---------- 4
4. Dorsal lobe not set off from lateral lobes ---------- 5
   Dorsal lobe set off from lateral lobes by a more or less distinct notch ---------- 6
5. Medio-lateral and postero-lateral rays of bursa scarcely separated; eggs with smooth shells ---------- **N. filicollis.**
   Medio-lateral and postero-lateral rays of bursa well separated; eggs with alveolate shells ---------- **N. roscidus.**
6. Tip of spicule pointed ---------- 7
   Tip of spicule not pointed ---------- 9
7. One spicule slightly shorter than the other, and the two twisted at the end ---------- **N. abnormalis.**
   Spicules equal in length, tips not twisted ---------- 8
8. Spicules 0.532 mm. long; tail of female conical; anus 140μ from end of tail; in *Tayassus albirostris* and *T. tajacu* ---------- **N. molini.**
   Spicules 0.90 mm. to 1.25 mm. long; tail of female truncate; anus 70 to 80 μ from end of tail ---------- **N. helvetianus.**
9. Tip of spicule spoon-shaped; vulva at junction of posterior and middle thirds of body ---------- **N. spathiger.**
   Tip of spicule ending in a membranous bulb; vulva about one-fourth of body length from posterior end of body; in rabbits ---------- **N. leporis.**
10. Vulva anterior to middle of body ---------- 11
    Vulva posterior to middle of body ---------- 12
11. Vulva one-third of body length from anterior end; anus 145 to 150μ from end of tail; spicules 5 to 5.36 mm. long ---------- **N. dromedarii.**
    Vulva about 1 mm. anterior to middle of body; anus 100 to 115μ from end of tail; spicules 4.1 to 4.4 mm. long ---------- **N. antilocaprae.**
12. Vulva 4 mm. or more posterior to middle of body; both uteri posterior to vulva opening; spicules 4.5 to 5.5 mm. long ---------- **N. mauritanicus.**
    Vulva at or near the union of posterior and middle thirds of body; one uterus anterior and one posterior to vulva ---------- 13
13. Anus 80μ from tip of tail; egg 75 to 100μ long by 50 to 75μ wide; spicules 2.75 mm. long ---------- **N. tarandi.**
    Anus 120μ from tip of tail; egg 145 to 190μ long by 80 to 90μ wide; spicules 3 to 3.4 mm. long ---------- **N. neotoma.**

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MAY, HENRY G.

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EXPLANATION OF PLATE

Nematodirus antilocaprae, new species

FIG. 1. Bursa, lateral view.

2. Bursa, ventral view: *d.*, Dorsal ray; *exd.*, externo-dorsal ray; *ex l.*, externo-lateral ray; *lv.*, latero-ventral ray; *ml.*, medio-lateral ray; *pl.*, postero-lateral ray; *v v.*, ventro-ventral ray.

3. Tip of spicule.

4. Posterior end of female.

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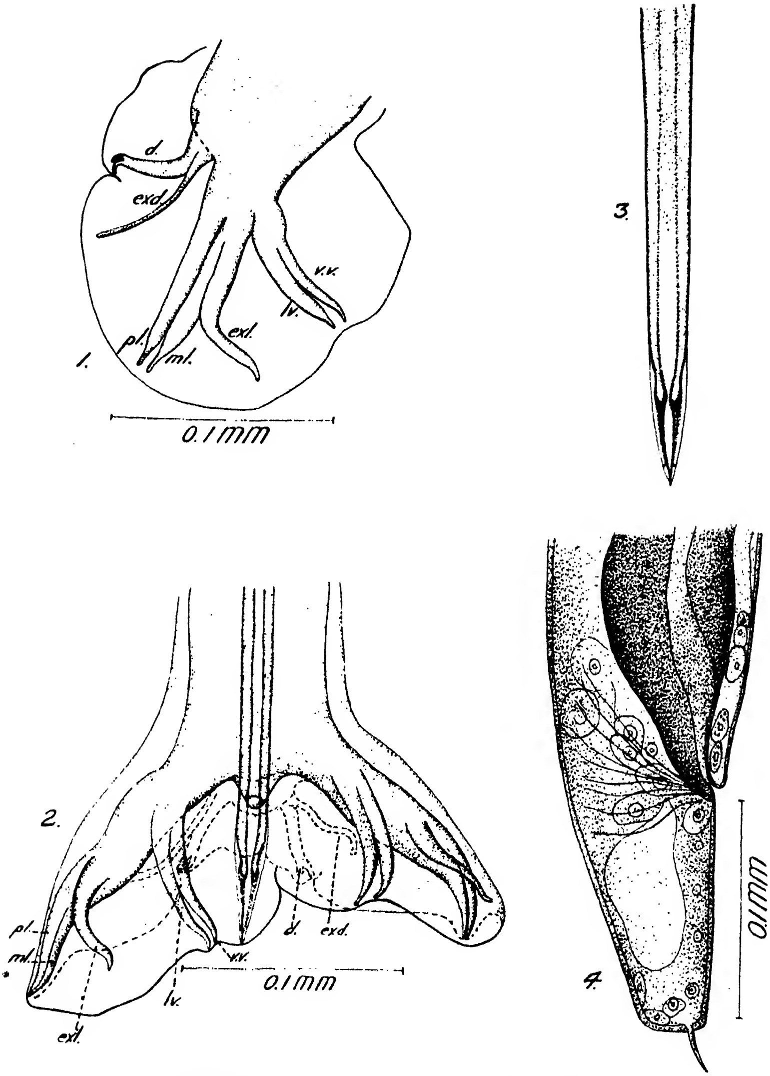

NEMATODIRUS ANTILOCAPRAE, NEW SPECIES

FOR EXPLANATION OF PLATE SEE PAGE 4

A FOSSIL INSECT FROM THE LOWER PERMIAN OF THE GRAND CANYON

By Frank M. Carpenter
Of the Bussey Institution of Harvard University

In the latter part of April, 1926, Mr. C. W. Gilmore, returning to the National Museum with a collection of footprints from the Hermit Shale of the Grand Canyon, found among these fossils a large insect wing (Order Protodonata), which had previously been unnoticed. This specimen was forwarded to me by Dr. A. Wetmore, to whom I am also indebted for this opportunity of studying the first fossil insect from the Grand Canyon.

The term "Hermit Shale" was applied by Noble (1922) to the strata previously designated as the "Shale of the Supai Formation," included between the Cocconcino Sandstone (Permian) and the unconformity topping the Lower Supai Sandstone (Pennsylvania). Typical exposures of the Hermit Shale have been described and figured in the writings of Noble (1914, 1922) and Schuchert (1918), on the Paleozoic of the Grand Canyon, and many of the following comments on the geology and paleontology of the deposit have been derived from these sources. The Hermit Shale is a marked contrast to other Paleozoic insect deposits, which are usually characterized by discouragingly small exposures. At the Hermit Basin the shale is from 267 to 317 feet thick; at the Bass Canyon it is 332 feet thick; at the west end of the Kaibab division it is more than 500 feet thick, and may reach 775 feet at the Kaibab Canyon. Noble (1922) described the beds as consisting of deep brick-red shales and fine-grained friable sandstones. "The beds differ little from one another in composition and consist essentially of sandy mud colored by red ferritic pigment. * * * Many beds exhibit sun cracks and rain prints, and some beds are ripple marked."

Fossils from the Hermit Shale are few in number, but are sufficient to determine the geological position of the deposit. The first specimens were found by Schuchert in 1915. "Just below the sign 'Red Top' in the lower turn of the Hermit Trail and immediately above the thick upper sandstone of the Lower Supai are seen thin-bedded red shaly sandstones alternating with deep red zones of shale. The surfaces of the glistening and smooth platy sandstones are replete with the fillings of the small prisms of interbedded sun-cracked shales, and are often rain-pitted, and further marked by the feet impres-

sions of fresh-water amphibians * * * *Megapezia* (?) *coloradensis* [Lull, 1918], and *Exocampe* (?) *delicatula* [Lull, 1918]. Some of the tracks are distinct impressions of the feet, and others are mere strokes of the toes. In these same beds also occur plant remains in very fragmentary condition which were badly macerated and coated with a slime of red mud during their entombment. They are therefore difficult to determine, but after much effort Dr. David White tentatively identified them as *Callipteris* sp., cf. *C. conferta*, *Walchia* cf. *W. gracilis*, *Gigantopteris*, and cf. *Sphenophyllum*" (Schuchert, 1918). The footprints are of little value in determining the age of the deposit, but the plants led Doctor White to consider the Lower Permian as most probable. "The condition of preservation of the fragments is so bad that caution is necessary in basing conclusions of any kind on the material submitted. However, the presence of *Gigantopteris*, *Walchia*, and probably of *Callipteris*, if my tentative generic classification of the latter is correct, points to the Lower Permian age of the flora" (Schuchert, 1918).

In 1916 Doctor Noble made a second collection of plant material from the beds at the Hermit Trail. This collection was again examined by Doctor White, who determined the species as *Pecopteris* (?) species, *Alethopteris* (?) species, and *Callipteris* (?) species, which once more indicated that the beds were Permian age, or possibly the very latest Pennsylvania. In 1920 Noble again collected at the Hermit Basin, in addition to a few other plants, a well-preserved specimen of a species of *Callipteris*. In connection with this specimen Doctor White said: "* * * This evidence practically confirms conclusively the opinions based on fragments previously collected * * * and is of itself probably adequate to prove the Permian age of the Hermit Shale" (Noble, 1922).

The rock containing the insect is clearly from the "fine grained friable sandstone," rather than from the shale bed, and is a poor type of rock for the proper preservation of an insect. The surface is very rough and irregular, and the wing shows signs of maceration, as in the case of the plants examined by Doctor White. The condition of the specimen is rendered even worse by the lack of the reverse, which appears to have broken away with the obverse half of the center of the wing. Had the fossil represented a new group of insects, it would have been impossible to determine its affinities with any degree of satisfaction. Fortunately, the species is easily recognized as belonging to the Order Protodonata, and may be placed in a genus already established by Sellards.

Family MEGANEURIDAE

The subfamily Typinae, to which this new species unquestionably belongs, consists of two genera from the Lower Permian of Kansas:

Typus Sellards, and *Megatypus* Tillyard. *Typus* may be distinguished (Tillyard, 1925) by having R_3 arising before the middle of the wing; AC, a simple cross-vein situated obliquely between two normal cross-veins; a single row of cellulose between 1A and 2A; and wings about ten centimeters long. In *Megatypus*, R_3 originates beyond the middle of the wing; AC is a strongly formed (concave), oblique vein connecting Cu_2 with 1A; there are two or more rows of cellules between 1A and 2A; and the wings are from 18 to 30 centimeters long. In the fossil from the Grand Canyon there are no traces of cellules or of the anal crossing, but the absence of AC suggests that this vein was only weakly developed, as in *Typus*, and not well developed, as in *Megatypus*. R_3 arises at least slightly basally of the middle of the wing, which is 10.5 cm. long, so that this species, although lacking many other features, may be placed in the genus *Typus* with very little chance of error.

Genus TYPUS Sellards

Typus Sellards, Amer. Journ. Sci., ser. 4, vol. 22, pp. 249–258, 1906.—Tillyard, Amer. Journ. Sci., ser. 5, vol. 10, pp. 41–62, 1925.

TYPUS GILMOREI, new species

Plate 1

Described from a nearly complete, left forewing, viewed from above, with the following characteristics: Wing narrow and elongate, with a pointed apex, and a reduced anal area; length of wing, 10.5 cm.; greatest width, at the middle of the wing, 2.3 cm.; width at the base, 1.5 cm.; precostal area small; Sc (concave) long, extending beyond the middle of the wing; R_2 and R_3 (both concave) apparently diverging at a point just basal of the middle of the wing; Cu_2 (concave) broadly undulated; 1A (convex) only slightly undulated. These are the only characters which can be assigned to the species with moderate certainty. The costal margin appears to have been macerated away, so that its shape is a question, but one would assume from the basal and apical portions that it was nearly straight. The furrow of the subcosta can be traced indistinctly along this missing area almost to the apex of the wing. The presence of this shallow furrow, which can be seen in the photograph, supports the idea of maceration, since it would indicate that although the front part of the wing membrane was badly decomposed, the strong subcosta was nevertheless able to make a faint impression in the sandy mud. The R+M stem is very obscure at the base, appearing as an interrupted and irregular series of projections. R_1 (convex), and R_2 and R_3 (both concave) are plainly visible at the middle of the wing, but the origin of the radial sector is very indistinct. The media is so obscure as to be almost invisible, except at the base where there is a suspicion of a convex ridge. Cu_2 (concave) is very distinct at the base, but the remainder has been broken away. 1A (convex)

and 2A (concave) are also distinct at the base, but only 2A can be traced to its extremity. There is a weak convex branch leading from 1A, and sending a few branchlets to the posterior margin of the wing. The only cross-veins to be seen are on the basal part of the costal area; the anal crossing is not preserved. This wing is about the same size as *Typus permianus* Sellards, but differs in having the hind margin more arched, and Cu_2 and 1A more distinctly undulated.

Holotype, Catalogue number 71279, U.S.N.M.

Locality, Hermit Shale, about one-quarter mile west of the sign "Red Top" on the Hermit Trail in the Grand Canyon National Park, Arizona.

Horizon, Lower Permian.

I have named this species for its collector, Mr. C. W. Gilmore, of the National Museum.

The taxonomic contribution of *Typus gilmorei*, new species, is not very great, because it is so poorly preserved, but it does add a new and interesting locality to the three others which have yielded Meganeurids: The Upper Carboniferous of Commentry, France; the Radstock Coal Measures of Somerset, England; and the Lower Permian limestone of Elmo, Kansas. Geologically, it is of interest also, for it confirms, if any confirmation is needed, the plant evidence referring the Hermit Shale to the Lower Permian, since it belongs to an order of insects known only from the uppermost Pennsylvanian and the Lower Permian, and readily falls into a genus from the latter horizon.

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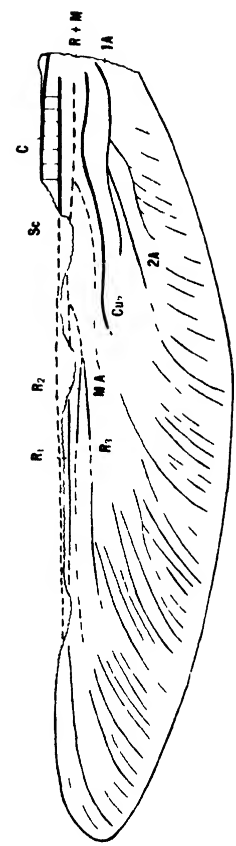
EXPLANATION OF PLATE

FIG. 1. Photograph of holotype of *Typus gilmorei*, new species, from the Hermit Shale of the Grand Canyon. Natural size. Cat. No. 71279, U.S.N.M.

FIG. 2. Venation of *Typus gilmorei*, new species. C, costa (convex); Sc. subcosta (concave); R_1, radius (convex); R_2 and R_5, branches of the radial sector (both concave); MA, anterior branch of the media (convex); Cu_2, posterior branch of the cubitus (concave); 1A, first anal (convex); 2A, second anal (concave).

O



A FOSSIL INSECT FROM THE GRAND CANYON

FOR EXPLANATION OF PLATE SEE PAGE 4

CATALOGUE OF HUMAN CRANIA IN THE UNITED STATES NATIONAL MUSEUM COLLECTIONS

By Aleš Hrdlička [1]

Curator, Division of Physical Anthropology, United States National Museum

In 1925, under the auspices of the Smithsonian Institution and the Buffalo Society of Natural Sciences, the writer made a seven-month journey to south Asia, Java, Australia, and South Africa.[2] One of the principal aims of this trip was to examine, by the instruments and methods used in measuring the American material that is being published in this catalogue, all the Australian, Tasmanian, and South African crania that could be located, so as to obtain uniform and as extensive as possible data on this rare material, and to get all possible further light on the problems of the racial status of the Tasmanians, Bushmen, and Hottentots.

In Australia was found a great deal more than was expected, and due to the kind cooperation of the Australian museums and departments of anatomy in Adelaide, Melbourne and Sydney, as well as that of scientific men outside of these establishments,[3] it was possible to measure there nearly 1,000 crania identified as to locality, besides a small series of the skulls of Tasmanians. The data on the latter could later be supplemented, thanks to the courtesy of Sir Arthur Keith, by the writer's measurements on all the well-identified Tasmanian skulls in the Royal College of Surgeons, London.

The South African material was rather disappointing. An important part of the cranial collections at Cape Town had been sent some time previously to Switzerland, and at Johannesburg the anthropological collections are just starting. Nevertheless, in the Museum

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[1] See also first section of this catalogue on the Mongolians, Eskimo, Aleuts, and Alaska Indians in the Proceedings of the U. S. National Museum, vol. 63, art. 12, published on March 14, 1924. A second section on the Algonkin and related Iroquois, Siouan, Caddoan, Salish and Sahaptin, Shoshonean, and Californian Indians, published in the Proceedings of the U. S. National Museum, vol. 69, art. 5, was issued on May 4, 1927.

[2] See *Smithsonian Explorations*, etc. in 1925, Wash., 1926, 58 *et seq.*

[3] Cordial thanks of the writer are due particularly to: Dr. E. A. White, director of the Museum, Adelaide; Dr. J. A. Kershaw, curator of the National Museum, Melbourne; Dr. C. Anderson, director of the Australian Museum, Sydney; Professors of Anatomy R. J. A. Berry (Melbourne), F. Wood Jones (Adelaide), and A. N. Burkitt (Sydney); Drs. Herbert Basedow and R. H. Pulleine at Adelaide; and the United States consul general at Melbourne.

and the Anatomical Department at Cape Town there were found series of valuable specimens, which were measured.[4]

The measurements, together with those of the few crania from Australia in the possession of the United States National Museum, are given in this number of the catalogue, with such simple deductions as appear to be most obvious; the main object of this catalogue being not so much to discuss results as to present to anthropological workers anthropometric data obtained carefully, uniformly and by well-tested instruments, so that they may be utilized with due confidence for racial and especially variational studies.

The Australian data have been arranged on a geographical basis, and by the value of the cephalic index. A more detailed geographical subdivision would have been of little value, for some of the localities are hard to find on the maps, and do not represent different tribes; while for a tribal subdivision the information found with the specimens was mostly insufficient.

The utmost care was given to the identification of the sex, and whenever other parts of the skeleton were present they were consulted, unless the identification of the skull was plain. The sexing of the Australian skull is not always easy, some of the females closely resembling males, and the same applies, though for the opposite reason (some of the males presenting rather female characters), to the South African blacks. It is no wonder that some of the older sex identifications, particularly perhaps with the Tasmanians, were found to be erroneous.

No immature, deformed, abnormal, or mix-blood (so far as known, or where there was a justified suspicion) specimens were included.

In Australia considerable difficulty was encountered with the measurements of the face and the nose. There was a widespread habit among the people of that continent to knock out, on the advent of adolesence, from one to four of the front teeth, the result being more or less absorption of the alveolar process and loss of the alveolar-point landmark. With the nose, on the other hand, the difficulty lay in the peculiarity of the lower border of the aperture. In many cases there was found a double inferior border, a higher internal and a lower external one, with a depression (prenasal fossa) between; or there was but the higher border, the lower one being indistinct. The proper measurement of the nasal height, it was determined, is to the level of the upper border, which is also the level of the nasal floor. No other race presents such great difficulties in this region as the Australians (and Tasmanians), and it is practically certain that in some previous records on the Australian skulls the nasal height has been measured so that the results are not comparable with ours.

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[4] Thanks for kind aid in this task are due to Prof. M. R. Drennan, anatomist of the Cape Town University; the authorities of the Cape Town Museum; and to Prof. Raymond A. Dast, anatomist of the University of Johannesburg.

A large majority of the specimens here given have been measured or are reported upon for the first time. In other cases, especially with the Tasmanians, the crania have been worked over previously, in some instances more than once; but details and especially uniformity were generally lacking.

The measurement of cranial capacity could, regrettably, not be taken, due to lack of necessary apparatus. In estimating this it should be borne in mind that the Australian skull is on the average very perceptibly thicker than that of the white man.[a]

ABBREVIATIONS

A. L. A. = Anatomical Laboratory, University of Adelaide.
A. L. M. = Anatomical Laboratory, University of Melbourne.
A. L. S. = Anatomical Laboratory, University of Sydney.
A. M. S. = Australian Museum, Sydney.
C. T. U. = Department of Anatomy, Cape Town University.
N. M. M. = National Museum, Melbourne.
R. C. S. = Royal College of Surgeons, London.
S. A. M. = South African Museum, Cape Town.
S. A. M. A. = South Australian Museum, Adelaide.

1 About.
2 Teeth medium worn (more than moderate).
3 Not high.
4 Teeth somewhat worn.
5 Near.
6 Right upper median incisor missing (knocked out).
7 Teeth slightly worn.
8 Left upper median incisor missing (knocked out).
9 Teeth in good condition (not worn or worn but very slightly).
10 Teeth much worn.
11 Teeth moderately worn.
12 Teeth medium worn.
13 Upper median incisors missing.
14 Left lower median incisor missing.
15 Teeth mostly lost.
16 Moderately high.
17 Right lower median incisor missing.
18 Lower border distinct.
19 Right.
20 Left.
21 Lower median incisors missing.
22 Low.
23 Alveolar process in good condition.
24 Teeth in very good condition.
25 Front teeth slightly worn.
26 Occiput somewhat compressed.
27 Teeth nearly in good condition.
28 Vault not fully normal.
29 Right incisor knocked out.
30 Teeth very much worn.
31 Upper right incisors missing.
32 Teeth lost.
33 Right upper lateral incisor missing.
34 Zygomae very heavy.
35 All upper incisors missing.
36 Left upper lateral incisor missing.
37 Very megaseme.
38 Rather low.
39 Not exceptionally high.
40 No abscesses.
41 Right upper incisors missing (knocked out).
42 Lower laterals broken.
43 Lower border nearly distinct.
44 Both upper median and right upper lateral incisors missing.
45 Median incisors missing.

[a] For efficient help in the preparation of the data for publication, with this as with the previous numbers of this catalogue, the author is indebted to Mr. Dale Stewart, aide in the Division of Physical Anthropology, United States National Museum.

AUSTRALIANS

SOUTH AUSTRALIAN CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
b33	S. A. M. A.	Meningie	Adult	21.6	[1] 12.9	(13.6)	*59.7*	*(79.1)*	(16.03)							
48	do	Near Adelaide	do	19.6	12.4	13	*63.3*	*81.2*	15			12.7			10.9	10.6
H14	do	Murray Bridge	do	19.4	12.3	13.1	*63.4*	*82.9*	14.93							10.2
297	do	Swanport	do	20.1	12.8	12.2	*63.7*	*74.4*	15.03	[2] 12	7.5	14.2	*84.5*	*52.8*	11.4	10.9
B9	do	Near Adelaide	do	19.7	12.6	([3])	*64*				6.4	12.8		*50*		
256	do	Fulham	do	19.7	12.8	12.3	*65*	*75.9*	14.93	[4] 11.4	6.8				10.9	10.4
444	do	Near Morgan	do	19.7	12.8	13.4	*65*	*82.7*	15.3	[4] 11.6	7.1	13.5	*85.9*	*52.6*	10.6	10.4
329	do	Swanport	do	18.7	[5] 12.2		*65.2*				[6] 5.7	13.8		*41.3*		
321	do	do	do	20.2	13.2	13.5	*65.4*	*80.8*	15.63	[6] 11.2	6.9	13.8	*81.2*	*50*	10.5	10.1
322	do	do	do	19.7	12.9	13.8	*65.5*	*84.7*	15.47	[7] 11.4	[8] 6.7	13.5	*84.4*	*49.6*	10.8	10.6
372	do	Fulham	do	[5] 19.2	12.6	13	*65.6*	*81.8*	14.93							11
c1367	do	Adelaide	do	19.2	12.6	13.5	*65.6*	*84.9*	15.1	[9] 11.8	7.4	[8] 13.4	*88.1*	*55.2*	10.6	10.4
L	do	Near Murray Bridge	do	19.2	12.6	13.2	*65.6*	*83*	15	[7] 11.4	7	[1] 13.6	*83.8*	*51.2*	11.3	10.6
dD	do	Torren's Island	do	20.4	[5] 13.4	13.5	*65.7*	*79.9*	15.77		7.8					10.9
104	do	N. W. Bend	do	19.1	12.6	13.4	*66*	*84.8*	15.03						10.8	10.2
300	do	Swanport	do	19.4	12.8	12.4	*66*	*77*	14.87		7.5	13.5		*55.6*	11.8	10.7
c11459	do	Near Adelaide	do	18.8	12.4		*66*			[4] 10.3	6.4					
40	A. L. A.	Bookabie	do	20.6	13.6	13	*66*	*78*	15.73	[9] 11	6.7	13.7	*80.3*	*48.9*	11.8	10.6
382	S. A. M. A.	Sydenham, Torrens River.	do	19	12.6	13.2	*66.3*	*83.5*	14.93		[5] 6.9	13.4		*51.5*	[9] 10.5	10.2
C1	Dr. Campbell's	"Extreme South"	do	18.1	12	12.6	*66.3*	*84*	14.23		6.5	12.2		*53.3*	10.2	9.8
B6	S. A. M. A.	Coorong	do	19.7	13.1	12.5	*66.5*	*76.2*	15.1	[7] 11.9	7.7	13.3	*89.5*	*57.9*	11	10.5
260	do	Swanport	do	19.5	13	12.4	*66.7*	*76.5*	14.97		6.7	14		*47.9*	11.2	10.8
335	do	do	do	19.8	13.2	12.5	*66.7*	*75.8*	15.17	[7] 10.7	6.4	13.6	*78.7*	*47.1*	11.4	10
344	do	do	do	19.8	13.2	13.7	*66.7*	*83*	15.57							
224	do	Port Pirie	do	18.7	12.5	13.8	*66.8*	*83.5*	15		6.5	13		*50*	10.8	10.4
246	do	Swanport	do	19.3	12.9	13.2	*66.8*	*82*	15.13		7.2	13.3		*54.1*	11.1	10.4
264	do	do	do	18.7	12.5	13	*66.8*	*83.3*	14.73		6.9	12.8		*53.9*	10.1	10
31	A. L. A.	North West Bend	do	19.1	12.8	13.4	*67*	*83.8*	15.10		[6] 6.6	13.4		*49.2*	10.3	10.3
293	S. A. M. A.	Swanport	do	18.8	12.6	13.1	*67*	*83.4*	14.83	[10] 10.6	6.8	13.6	*77.9*	*50*	10.7	10.3
127	do	Innamincka	do	18.9	12.7	13.2	*67.2*	*83.5*	14.93	[11] 11.6	[8] 7	13	*89.2*	*53.8*	[1] 10.2	9.9

302	do	Swanport	do	19.2	12.9	12	67.2	75	14.70	[4] 12.2	7.7	13.8	88.4	55.8	11.1	10.4
313	do	do	do	18.9	12.7	13.1	67.2	82.9	14.90	[4] 12.6	7.6	13.8	91.3	55.1	10.8	10.6
A_1	do	Wellington	do	18.9	12.7	13.5	67.2	85.4	15.03		6.8	13.1		51.9	11.1	10.8
[a] 23	do	Mannum	do	19.8	13.3	13.8	67.2	83.1	15.63	[9] 13.7	8.3	13.4	102.2	61.9	11	11.5
339	do	Swanport	do	19.6	13.2	13.3	67.4	81.1	15.37		6.2	[5] 13.9		44.6	11.1	10.3
416	do	Wood's Point	do	19	12.8	12.7	67.4	79.9	14.83	[9,5] 10.3	6.3	[5] 13.6	75.7	46.3	10.2	10.2
[b] G	do	Mallala	do	19.3	13	13.5	67.4	83.3	15.27	[11] 11.3	7.2	[5] 13	86.9	55.4	10.9	9.6
16	A. L. A.	Oodnadatta	do	19	12.8	12.7	67.4	79.9	14.83	[12] 11.7	7.4	13.2	88.6	56.1	11	10.2
36	S. A. M. A.	Umberatana	do	19.1	12.9	13	67.5	81.2	15		6.7	14		47.9	10.3	10.4
124	do	Cooper Creek	do	18.8	12.7	13.1	67.6	82.9	14.87		(14)					9.8
234	do	Swanport	do	19.2	13	13.2	67.7	82	15.13	[9] 10.8	6.5	13.4	80.6	48.5	10.8	10.4
A_6	do	Near Adelaide	do	19.5	13.2	12.4	67.7	75.6	15.03	[10] 10.9	6.6	13.9	78.4	47.5	11.3	10.2
373	do	Fulham	do	19.8	13.4	11.6	67.7	69.9	14.93							10.1
[f] H_3	do	Mypanya Jetty	do	19.2	13	11.8	67.7	73.5	14.67	[2] 10.6	6.6	13	81.5	50.8	10.5	10
	Dr. Pulleine's	Tailem Bend	do	19.2	13	13.7	67.7	85.1	15.30	[2] 11.9	[15] 6.9	13.6	87.5	50.7	10.5	10.4
[a] 26	S. A. M. A.	Coorong	do	19.6	13.3	13.6	67.9	82.9	15.50		6.6	13.4		49.3	11	10.6
131	do	Tailem Bend	do	19	12.9	12.4	67.9	77.5	14.77	[2] 11.2	6.8	14.4	77.8	47.2	10.2	9.8
159	do	Morgan	do	19.6	13.3	14.3	67.9	87.2	15.73	[4] 12.1	7.3	13.3	91	54.9	10.6	10.2
[c] 11,458	do	Near Adelaide	do	19.4	13.2	13.6	68	83.4	15.40							10.4
369	do	Fulham	do	19.4	13.2	14.1	68	86.5	15.57							10.8
I	do	do	do	19.8	13.5		68.2									
116	do	Coorong	do	18.6	12.7	12.9	68.3	82.7	14.73	[2] 11.9	7.4	13	91.5	56.9	10.5	9.8
225	do	Marion	do	19.3	13.2	13	68.4	80.2	15.17	[7] 12.1	7.3	12.8	94.5	57	11.6	10.6
308	do	Swanport	do	19.3	13.2	12.6	68.4	77.8	15.03	[3] 11.2	6.7	13.2	84.8	50.8	10.9	10
337	do	do	do	19	[1] (13)		(68.4)			[9] 11.3	7.1	[5] 13.1	86.3	54.2		
[c] 11,418	do	do	do	19.6	13.4	13.6	68.4	82.4	15.53	[10] 11.2	[6] 6.9	14	80	49.3	11	11
[h] 255	do	do	do	[5] 19.6	[5] 13.4	12.9	68.4	78.2	15.30		(8)					10.5
108	do	Walkerville	do	18.4	12.6	13	68.5	83.9	14.67	[4] 11.9	7.3	[5] 12.7	93.7	57.5	11.1	10.2
M	do	Torrens Island	do	18.5	12.7	13.2	68.6	84.6	14.80	[2] 11.7	7.1	13.2	88.6	53.8	10.9	9.7
H_1	do	Murray Bridge	do	18.8	12.9	13.4	68.6	84.8	15.03	[4] 11.3	6.8	14.2	79.6	47.9	11.3	10.5
388	do	Mount Gambier	do	19.4	13.3	14	68.6	85.4	15.57							10.1
6	A. L. A.	Ardrossan	do	20.4	14	13.2	68.6	76.7	15.87	[2] 13.1	8.6	14.3	91.6	60.1	11.4	11.2
311	S. A. M. A.	Swanport	do	19.5	13.4	13.4	68.7	81.7	15.43	[2] 11.8	7.4	13.5	87.4	54.8	10.8	11
112	do	Hindmarsh Island	do	19.2	13.2	12.5	68.8	77.2	14.97		6.8	13.6		50	10.3	10.8
162	do	Morgan	do	19.2	13.2	13.6	68.8	84	15.33		7.4	[5] 14.3		51.8	11.1	10.4
237	do	Swanport	do	19.2	13.2	12.9	68.8	79.6	15.10	[9] 10.8	6.8	13.4	80.6	50.8	10.8	10.2
384	do	Sydenham, Torrens River.	do	19.2	13.2	13.2	68.8	81.5	15.20		6.8	13.7		49.6	11.6	10.6
[d] A	do	Near Adelaide	do	19.2	13.2	13.6	68.8	84	15.33		[6,5] 6.6	[5] 13.4		49.2	10.2	10.4
[e] N	do	Coorong	do	18.6	12.8	11.6	68.8	73.9	14.33	[4] 12.2	7.8	[5] 14	87.1	55.7	11.2	9.9
C_3	Dr. Campbell's	Lower Murray River	do	19.2	13.2	13.8	68.8	85.2	15.40		6.9	[5] 13.7		50.4	11.1	10.1
80	S. A. M. A.	Lake Alexandrina	do	19.7	13.6	12.6	69	75.9	15.30		7.2	13.6		52.9	10.7	10.4
298	do	Swanport	do	19	13.1	12.8	69	80	14.97	[2] 11.6	7.3	14	82.9	52.1	11.3	10.2
H_{12}	do	Inkerman	do	18.7	12.9	13.4	69	84.8	15		6.7	[5] 14		47.9	10.3	10.6
393	do	Coorong	do	19.7	13.6	13.3	69	80.1	15.53							10.5
16,566	N. M. M.	Lake Coorong	do	19.7	13.6	13.2	69	79.5	15.50							10.3
99	S. A. M. A.	Meningie	do	20.4	14.1	[11] 13.6	69.1	79.1	16.03	[4] 11.4	7	[5] 13.9	82	50.4		
315	do	Swanport	do	19.4	13.4	13.9	69.1	84.8	15.57		7	14.2		49.3	11.1	10.1
[a] 11,450	do	Near Turnby Bay	do	19.1	13.2	13.4	69.1	82.7	15.23	[2] 11	7.2	13.5	81.5	53.3	11	10.6
	Dr. Basedow's	Collinsville	do	19.4	13.4	13.6	69.1	82.9	15.47	[7] 12.2	7.3	13.1	93.1	55.7	11.1	10.7
44	S. A. M. A.	Near Adelaide	do	18.2	12.6	12.1	69.2	78.6	14.30		7.2	12.6		57.1	10.6	9.9

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 14.

SOUTH AUSTRALIAN CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
156	S. A. M. A.	Milang	Adult	19.5	13.5	13.2	*69.2*	*80*	15.40	[10] 11.7	[14] 7	13.8	*84.8*	*50.7*	------	10
238	do	Swanport	do	18.5	12.8	12.9	*69.2*	*82.7*	14.73	[10] 10.4	6.2	13.9	*74.8*	*44.6*	10.5	10.6
295	do	do	do	19.8	13.7	14	*69.2*	*83.3*	15.83	[7] 11.1	7	13.5	*82.2*	*51.8*	11	10.6
363	do	Fulham	do	20.1	13.9	12.8	*69.2*	*75.3*	15.60	[7] 12.1	7.2	------	------	------	10.2	10.2
[4] 35	A. L. A.	Glanville	do	18.8	13	12.4	*69.2*	*78*	14.73	[4] 11.2	6.7	12.9	*86.8*	*51.9*	10.7	10.3
C_4	Dr. Campbell's	Lower Murray River	do	18.8	13	13.6	*69.2*	*85.5*	15.13	------	------	[5] 13.7	------	------	------	10.8
[4] 107	S. A. M. A.	Plympton	do	17.6	12.2	12.8	*69.3*	*85.9*	14.20	[10] 11.3	7.2	12.7	*89*	*56.7*	11.9	10.5
161	do	Morgan	do	18.9	13.1	12.4	*69.3*	*77.5*	14.80	------	6.5	13.6	------	*47.8*	11.2	10.2
11	do	Parallana	do	19.3	13.4	12.8	*69.4*	*78*	15.17	------	6.8	------	------	------	9.4	9.9
168	do	Clare	do	19.6	13.6	12.9	*69.4*	*77.7*	15.37	------	7.1	[5] 14.4	------	*49.3*	11.8	11
86	do	Coorong	do	19.7	13.7	13	*69.5*	*77.8*	15.47	[4] 12	[5, 8] 7.3	13.5	*88.9*	*54.1*	10.8	10.5
11	A. L. A.	do	do	19	13.2	12.5	*69.5*	*77.6*	14.90	[12] 11.5	[5, 5] 6.8	13.5	*85.2*	*50.4*	------	9.7
233	S. A. M. A.	Swanport	do	19.4	13.5	12.4	*69.6*	*75.6*	15.10	[9] 10.9	6.5	14.3	*76.2*	*45.4*	10.9	10.4
292	do	do	do	19.4	13.5	13.3	*69.6*	*81.1*	15.40	------	[5, 13] 6.9	13.6	------	*50.7*	------	10.2
355	do	Fulham	do	19.4	13.5	13.7	*69.6*	*83.5*	15.53	------	[8] 6.7	------	------	------	10.2	10.9
415	do	Wood's Point, Murray River.	do	19.1	13.3	12.4	*69.6*	*76.5*	14.93	[4] 11.3	6.6	14.2	*79.6*	*46.5*	11	10
H_6	do	Coorong	do	19.1	13.3	13.2	*69.6*	*81.5*	15.20	------	7.4	13.3	------	*55.6*	10.4	10.2
15,897	N. M. M.	Tailem Bend	do	19.4	13.5	13.4	*69.6*	*81.7*	15.43	------	7.3	------	------	------	------	10.4
398	S. A. M. A.	Near Moonta	do	18.8	13.1	12.6	*69.7*	*78.8*	14.83	------	7.3	13.3	------	*54.9*	10.6	10.1
T_{11}	do	Swanport	do	19.5	13.6	13	*69.7*	*78.3*	15.37	------	7.4	[5] 14	------	*52.9*	11.4	10.8
21	do	Murray River	do	19.5	13.6	14	*69.7*	*84.3*	15.70	[9] 11.6	6.8	13.7	*84.7*	*49.6*	11	10.4
138	do	Port Adelaide	do	18.9	13.2	13.1	*69.8*	*81.9*	15.07	------	------	------	------	------	------	10.4
270	do	Swanport	do	18.6	13	13	*69.9*	*82.3*	14.87	[4] 10.8	6.8	13.7	*78.8*	*49.6*	10.6	10.5
273	do	do	do	18.6	13	13	*69.9*	*82.3*	14.87	[7] 11	6.9	[5] 13.4	*82.1*	*51.5*	10.5	10
[4] H_1	do	Tailem Bend	do	18.6	13	12.8	*69.9*	*81*	14.80	------	------	------	------	------	------	9.8
3	A. L. A.	Blinman	do	18.6	13	13.2	*69.9*	*85.5*	14.93	[3] 10.9	6.8	12.2	*89.3*	*55.7*	10.3	9.7
304	S. A. M. A.	Swanport	do	19	13.3	13	*70*	*80.2*	15.10	------	6.7	13.7	------	*48.9*	10.9	10.3
325	do	do	do	19.3	13.5	14	*70*	*85.4*	15.60	[4] 10.9	[5, 5] 6.5	14.5	*75.2*	*44.8*	[5] 10.7	10.5
A_4	do	Near Adelaide	do	19.7	13.8	11.8	*70*	*70.2*	15.10	------	------	------	------	------	------	10
283	do	Swanport	do	18.4	12.9	12.9	*70.1*	*82.7*	14.73	------	7	13.7	------	*51.1*	11.5	10.8
294	do	do	do	19.4	13.6	13.6	*70.1*	*82.4*	15.53	[3] 11.3	6.7	14.2	*79.6*	*47.2*	11.3	10.6
28	A. L. A.	Loxton	do	19.4	13.6	12.9	*70.1*	*78.2*	15.30	------	7.3	13.5	------	*54.1*	10.8	10.2
H_4	S. A. M. A.	Mypanya Jetty	do	18.8	13.2	11.9	*70.2*	*74.4*	14.63	------	6.4	13	------	*49.2*	10.8	10
22	do	Yorke Peninsula	do	18.6	13.1	12.6	*70.4*	*79.8*	14.77	11.6	7.1	12.1	*95.9*	*58.7*	10.9	9.6

[1] 262	do.	Swanport		18.6	13.1	12.6	70.4	79.8	14.77	[7] 11.2	6.7	13.4	88.6	50	10.8	9.8
435		Walkerie		19	13.4	13.4	70.5	82.7	15.27		7.2				10.9	10.6
105	do	North We		18.7	13.2	13	70.6	81.2	14.97							10
[1] 11,407	do	Balaklava		18.4	13		70.6			[10] 11.9	7.7	12.5	95.2	61.6		
B7	do	Meningie		19.4	13.7		70.6									
28,923	N. M. M	Cooro		19.4	13.7	12.6	70.6	75.9	15.23		6.7	13.7		48.9	10.6	10.1
419	S. A. M.	Robe	do	18.8	13.3	13.6	70.7	85	15.23		6.4	13.8		48.4	10.4	10.6
[1] 11,416	do		do	19.1	13.5	13.4	70.7	82.2	15.33	12	7.3	13.9	86.3	52.5	10.4	10.4
39	A. L. A.	Robe	do	18.8	13.3	13	70.7	81.2	15.03	[7] 10.7	6.4	13.6	78.7	47.1	9.8	10.1
• 4,881	S. A. M.		do	19.2	13.6	13.4	70.8	81.7	15.40	[7] 12.1	7.3	13.2	91.7	55.3	10.4	10.4
27	A. L. A.	Wallaroo	do	19.2	13.6	14	70.8	85.4	15.60		7.4	14		52.9	11.6	10.6
119	S. A. M.	Yorke Peninsu	do	18.9	13.4	12.8	70.9	79	15.03		7.7	12.9		59.7	10.8	9.6
250	do	Swanport	do	18.9	13.4	13.2	70.9	81.5	15.17		7.1				10.2	10.5
410	do	Yorke Peninsu	do	19.6	13.9	12.8	70.9	76.2	15.43	[2] 11.4	7.2	13.8	82.6	52.2	11.6	10.7
• 1368	do	Near Adelaide	do	18.9	13.4	12.8	70.9	79	15.03	[16] 10.6	[6] 7				10.5	9.8
37	A. L. A.	Cobdolla	do	19.6	13.9	13.2	70.9	78.6	15.57	[3] 12.4	7.8	14.1	87.9	55.3	11.9	10.6
15955	N. M. M.		do	20.3	14.4	13.8	70.9	79.3	16.17	[4] 12.7	7.6	14.2	89.4	53.5	12.6	11.5
84	S. A. M. A.	St. Kilda	do	18.6	13.2	13.5	71	84.9	15.10	[10] 11	6.6	13.2	83.3	50	11.2	10.4
[4] 92	do	Coorong	do	18.6	13.2	13.4	71	84.3	15.07	11.8	7	13.2	89.4	53	10.4	10.3
163	do	Port Augusta	Near a	19	13.5	13.2	71	81.5	15.23		6.4	12.8		50	9.8	9.8
345	do	Swanport	Adult	19.7	14	13.6	71.1	81	15.77	[4] 11.2	6.9	14	80	49.3	10.9	10.5
• 369	do	Adelaide	do	18.4	13.1	13.4	71.2	84.8	14.97	[10] 12.2	7.8	[3] 13.8	88.4	56.5	11.2	10.6
• 11410	do		do	18.4	13.1	13.5	71.2	85.4	15.00	[9] 11.4	[3, 11] 6.9	13.3	85.7	51.9		10.5
A4	do	Near Adelaide	do	19.8	14.1	13	71.2	76.5	15.63	[4] 11.3	[3, 6] 6.4	14.4	78.5	44.4	10.4	10.5
B3495	A. M. S.		do	19.1	13.6	12.9	71.2	78.7	15.20		7.9	[5] 13.3		59.4	10.8	10.2
16567	N. M. M.		do	19.8	14.1	13.7	71.2	80.6	15.87	[4] 11.7	6.7	14	88.6	47.9	10.7	9.8
30	S. A. M. A.	Port Lincoln	do	18.8	13.4	12.8	71.3	79.5	15.00		6.9	13		53.1	10.7	10.2
236	do	Swanport	do	18.8	13.4	12.8	71.3	79.5	15.00	[2] 10.8	6.8	14.2	76.1	47.9	10.3	10.2
254	do	do	do	18.8	13.4	• 2.6	71.3	78.3	14.93		[5, 6] 7	13.6		51.2		
257	do	do	do	18.8	13.4	13	71.3	80.8	15.07	[7] 12.3	[5, 6] 7.2	[5] 13.9	88.5	51.8	10.4	9.8
[4] 570	do	Near Needles	do	19.6	14	[5] 13.3	71.4	79.2	15.63	(7)						10.5
H5	do	Near Adelaide	do	19.6	14	13.3	71.4	79.2	15.63		6.3	12.5		50.4	10.4	9.8
258	do	Swanport	do	18.6	13.3	13.2	71.5	82.5	15.03		6.8	[5] 13.3		51.1	9.8	9.7
H6	do	Meningie	do	18.6	13.3	12.7	71.5	79.4	14.87	[4] 11.3	7.2	[5] 13.8	81.9	52.2	11	9.9
102	do	Murray Bridg	do	19	13.6	13.6	71.6	83.4	15.40		[5] 6.3	13.6		46.3	10.1	10.2
309	do	Swanport	do	19.7	14.1	13.3	71.6	78.7	15.70	[10] 11.1	7.1	[5] 13.9	79.9	51.1	10.1	10.6
16	do	Streaky Bay	do	18.4	13.2	13.6	71.7	86.1	15.07	11.4	6.9	13.5	84.4	51.1	11	10.4
35	do	Goolwa	do	18.4	13.2	11.8	71.7	74.7	14.47		6.7	13.4		50	9.9	9.9
157	do	Lake Albert	do	18.4	13.2	12.2	71.7	77.2	14.60		6.5	13.9		46.8	10.7	10.4
288	do	Swanport	do	18.4	13.2	13	71.7	82.3	14.87	[4] 11.1	6.9	13.5	88.2	51.1	10.1	10
63	do	Lake Alexand	do	19.2	13.8	13.7	71.9	83	15.57		6.7	[5] 13.5		49.6	10	10
155	do	Milang	do	19.6	14.1	13.1	71.9	78	15.60	[7] 11	6.7	14.1	78	47.5	11	9.9
396	do	Coorong	do	18.6	13.4	12.1	72	75.6	14.70	[4] 12	7.1	13.1	91.6	54.2	10.1	9.4
3075	do	Glenely	do	18.6	13.4	12.6	72	78.8	14.87	[3] 11	6.9	14	78.6	49.3	10.6	10.1
8	do	Coorong	do	18.9	13.6		72				(13)	12.9				
28928	N. M. M.	do	do	18.2	18.1	12.6	72	80.8	14.63		7	14.1		49.6	10.4	10
281	S. A. M. A.	do	do	19	[5] 13.7	14	72.1	85.4	15.57		7.3				11	10.4
336	do	Swanport	do	19	13.7	13.2	72.1	80.5	15.30	[7] 10.7	6	13.5	79.3	44.4	10.2	10
434	do	W[illegible]ie	do	19	13.7	13.6	72.1	82.9	15.43		7.1				[1] 11.6	10.5
H13	do	M[illegible] Bridg	do	19	13.7	13	72.1	79.3	15.23							9.9
411	do	Ar[illegible]an	do	19.4	14	[5] 12.6	72.2	75.4	15.33	[10] 12	7.9	13.7	87.6	57.7		

NOTE.— [illegible] tes to [illegible] see [illegible] letters see p. 14.

SOUTH AUSTRALIAN CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
418	S. A. M. A.	Woods Point	Adult	18.8	13.6	----	*72.3*	----	----	([15])	5.9	14.1	----	*41.8*	----	----
420	do	Meningie	do	18.8	13.6	12.8	*72.3*	*79*	15.07	[4] 11.1	7	14	*79.3*	*50*	10.4	10.3
120	do	Oodnadatta	do	18.5	13.4	13.3	*72.4*	*83.1*	15.07	[9] 13.1	8.1	13.4	*97.8*	*60.4*	11	10.8
287	do	Swanport	do	18.1	13.1	13.4	*72.4*	*85.9*	14.87	[4] 11.6	7.2	13.6	*85.3*	*52.9*	9.9	9.9
	Dr. Campbell's	Eyres Peninsula	do	19.2	13.9	12.6	*72.4*	*75.9*	15.23	[7] 11.6	7.3	13.8	*84.1*	*52.9*	10.8	10
101	S. A. M. A.	Plympton	do	18.9	13.7	13.4	*72.5*	*80.7*	15.33	----	----	----	----	----	----	10.4
	Dr. Campbell's	Yorke Peninsula	do	18.2	13.2	12.6	*72.5*	*80.2*	14.67	----	----	----	----	----	----	9.5
318	S. A. M. A.	Swanport	do	19	13.8	----	*72.6*	----	----	----	[6] 6.9	14	----	*49.3*	----	----
389	do	Mingbool, S. E.		18.6	13.5	13.6	*72.6*	*85*	15.23	[19] 9.4	5.8	13.7	*68.6*	*42.3*	10	10
406	do	Tailem Bend		19	13.8	13.8	*72.6*	*84.2*	15.53	----	7	13.3	----	*52.6*	10.3	10
436	do	Waikerie		19	13.8	13.9	*72.6*	*84.8*	15.57	----	[5] 7.2	13.7	----	*52.6*	[5] 10.6	10.3
282	do	Swanport		18.7	13.6	12.7	*72.7*	*78.4*	15	----	6.9	13.5	----	*51.1*	10.3	10.2
24	A. L. A.	Port Elliot		18.3	13.3	12.9	*72.7*	*81.6*	14.83	[4] 12	7	14.3	*83.9*	*49.6*	10.8	10.6
232	S. A. M.	Murray Brid		19.5	14.2	([16])	*72.8*	----	----	----	----	----	----	----	----	----
28	do	Coorong		19.2	14	13.1	*72.9*	*78.9*	15.43	12.2	7.2	13.9	*87.8*	*51.8*	10.2	10
1079	do	Lake Bonni		18.3	13.4	13	*73.2*	*82.3*	14.90	----	6.2	13.8	----	44.9	10	9.9
160	do	Morgan		18.7	13.7	13.4	*73.3*	*82.7*	15.27	----	7	14.1	----	*49.6*	[5] 10.8	10.9
208	do	North of M		18.7	13.7	12.5	*73.3*	*77.2*	14.97	(•)	7.6	13.9	----	54.7	[5] 10.4	9.8
394	do	Coor		18.7	13.7	12.2	*73.3*	*75.3*	14.87	[4] 10.7	6.2	13.9	*77*	*44.6*	10	9.5
29				18.8	13.8	12.4	*73.4*	*76.1*	15	11.3	6.8	13.6	*83.1*	*50*	10.4	10.2
226				18.4	13.5	13.3	*73.4*	*83.1*	15.07	[10] 11.4	[8] 6.8	[1] 13.7	*83.2*	*49.6*	10.5	10.4
A_1				18.4	13.5	12.9	*73.4*	*80.6*	14.93	----	[8] 7.2	12.8	----	*56.2*	10	9.8
Z	do	Near E	do	18.2	13.4	13.2	*73.6*	*83.5*	14.93	----	([13])	13.8	----	----	----	10
114	do	Lake All	do	19	14	13.4	*73.7*	*81.2*	15.47	[7] 11.3	6.9	13.9	*81.3*	*49.6*	10.7	10
	Dr. Campb	Near Ad lde.	Near adul	17.6	13	12.8	*73.9*	*83.7*	14.47	----	6.5	12.5	----	*52*	10.1	9.6
395	S. A. M. A.	Coorong	Adul	18.8	13.9	12.8	*73.9*	*78*	15.17	[10] 10.6	6.6	12.4	*85.5*	*53.2*	10.1	9.7
69	do	Murray		18.6	13.8	13.6	*74.2*	*84*	15.33	[8] 11.3	6.6	13.9	*81.3*	*47.5*	[8] 9.6	9.5
310	do		u	19.6	14.6	13.8	*74.5*	*80.7*	16	[10] 11.1	[8] 6.8	14	*79.3*	*48.6*	11.1	10.4
C_1	Dr. Campb		Near	17.7	13.2	12.6	*74.6*	*81.8*	14.50	----	----	----	----	----	10.4	9.8
1036	S. A. M. A.		Adul	18.8	14.1	13	*75*	*79.3*	15.30	----	7.1	[8] 14.7	----	*48.3*	10.8	10.2
4	Dr. Campb		do	17.[illegible]	13.2	12.1	*75.9*	*79.1*	14.23	----	6.6	12.7	----	*52*	10.3	9.6

[f] 425	S. A. M. A.	Cournamont	do	18.6	14.2	13.6	*76.3*	*82.9*	15.47	11.2	6.5	13.7	*81.8*	*47.4*	10.2	10
400	do	Coorong	do	18.8	14.4	13	*76.6*	*78.3*	15.40	[3] 11.7	[17] 7.4	14.1	*83*	*52.5*	10	10
Totals				(193) 3,779.1	(187) 2,621.3	(186) 2,431.9	(187)	(186)	(186)	(101) 1,156.4	(100) 1,175.9	(161) 2,182.7	(97)	(187)	(156) 1,670.5	(180) 1,868.3
Averages				*19.09*	*13.31*	*13.07*	*69.7*	*80.7*	*15.15*	*11.45*	*6.96*	*13.56*	*84.3*	*51.2*	*10.71*	*10.2*
Minima				17.4	12	11.6	*59.7*	*69.9*	14.20	9.4	5.7	12.1	*68.6*	*41.3*	9.4	9.4
Maxima				21.6	14.6	14.3	*76.6*	*88.5*	16.17	13.7	86	14.7	*102.2*	*61.9*	11.9	11.5

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°										
b 33	S. A. M. A.	Meningie	Adult													
48	do	Near Adelaide	do	9.8				3.18	4.05	*78.5*	4.85	2.75	*56.7*			
H14	do	Murray Bridge	do													
297	do	Swanport	do	10	67	51	3.5	3.7	3.9	*94.9*	[19] 5.05	2.85	*56.4*	6.5	6.7	*103.1*
B9	do	Near Adelaide	do				3.4	[19] 3.4	[19] 3.9	*87.2*	4.55	2.65	*58.2*			
256	do	Fulham	do	9.5	67.5	49	3.5	[19] 3.6	[19] 4	*90*	4.55	2.9	*63.7*	6.2	6.7	*108.1*
444	do	Near Morgan	do	9.6	68.5	58	3.8	3.3	3.9	*84.6*	[18] 4.85	2.7	*55.7*	6.1	7	*114.8*
329	do	Swanport	do					[20] 2.9	[20] 3.7	*78.4*	4.1	2.4	*58.5*	5.9	6.6	*111.9*
321	do	do	do	9.2	67	49.5	3.3	3.38	3.88	*87.1*	[19] 4.8	2.3	*47.9*	6	6.5	*108.3*
322	do	do	do	9.9	70.5	57	3.65	3.25	3.72	*87.4*	4.9	2.75	*56.1*	6.4	6.6	*103.1*
372	do	Fulham	do	10.6				3.7	3.8	*97.4*	4.8	2.65	*55.2*			
c 1367	do	Adelaide	do	9.2	68	49	3.6	3.48	4.15	*83.8*	5.2	2.8	*35.8*	6.5	7.1	*109.2*
L	do	Murray Bridge	do	10	66	48	3.4	3.38	3.95	*85.6*	5	2.8	*56*	6.6	7.3	*110.6*
d D	do	Torren's Island	do				3.8							7	7.4	*105.7*
104	do	N. W. Bend	do	9.4							4.85	2.6	*53.6*	6.5	6.9	*106.2*
300	do	Swanport	do	10	66	50.5		3.65	3.75	*97.3*	[18] 5.3	2.85	*53.8*	[8] 6.3	6.9	*109.5*
e 11459	do	Near Adelaide	do				3.3	3.3	3.8	*86.8*	[19] 4.4	2.55	*58*	6.2	7	*112.9*
40	A. L. A.	Bookabie	do	9.8	63	32	3.4	3.3	4.2	*78.6*	4.8	3.2	*66.7*	7.2	8	*111.1*
382	S. A. M. A.	Sydenham, Torrens River	do	9.4	68	53.5		3.65	4.05	*90.1*	4.8	2.95	*61.5*	[8] 6.1	6.7	*109.8*
C1	Dr. Campbell's	"Extreme South"	do	9	68	50		3.38	3.62	*93.4*	4.6	2.45	*53.3*	5.8	6.5	*112.1*
B6	S. A. M. A.	Coorong	do	9.9	65.5	58	[5] 3.4	3.6	3.95	*91.2*	5.1	2.6	*5*	6.6	7.1	*107.6*
260	do	Swanport	do	9.7	69	40		3.35	3.6	*93*	5	2.8	*56*	6.5	6.8	*104.6*
335	do	do	do	9.8	61	40	3.55	[20] 3.25	[20] 3.85	*84.4*	4.4	2.6	*59.1*	6.7	6.5	*97*
344	do	do	do													
224	do	Port Pirie	do	9.7	69	54.5		3.1	3.65	*84.9*	4.45	2.5	*56.2*	6.3	7	*111.1*
246	do	Swanport	do	9.6	65	48		3.22	3.9	*82.6*	4.85	2.8	*57.7*	6.5	6.8	*104.6*
264	do	do	do	9	69	55		3.18	3.85	*82.6*	[18] 4.8	2.4	*50*	6	6.3	*105*

NOTE.—For footnotes to reference figures see p. 8. For footnotes to reference letters see p. 14.

SOUTH AUSTRALIAN CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle °	Alv. Angle °	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
31	A. L. A	North West Bend	Adult	9.4	71.5	45		3.12	4.08	76.5	4.9	2.85	58.2	5.9	6.5	110.2
293	S. A. M. A	Swanport	do	9.6	68	52	3.5	3.3	3.78	87.3	[18] 4.9	2.6	53.1	6	6.6	110
127	do	Innamincka	do	8.9	67.5	50.5		3.68	4.15	88.7	4.8	2.65	55.2	[1] 6.3	6.8	107.9
302	do	Swanport	do	9.3	64	44	3.5	3.8	4.22	90	5.2	2.7	51.9	6.5	7.2	110.8
313	do	do	do	9.6	68	55.5	3.6	3.45	3.78	91.3	[18] 5.1	2.65	52	6	6.8	113.3
A_1	do	Wellington	do	9.8	69.5	51.5		[20] 3.05	[20] 3.8	80.3	4.55	2.75	60.4	6.2	6.7	108.1
[e] 23	do	Mannum	do	9.9	72	58.5	4.1	3.3	4	82.5	5.8	3.1	53.4	6.5	8	123.1
339	do	Swanport	do	10	66	49		[19] 3.2	[19] 3.9	88	4.45	2.4	53.9	5.8	6.8	117.2
416	do	Wood's Point	do	9.2	72	51	2.8	[20] 3.55	[20] 3.8	93.4	[16] 4.75	2.65	55.8	6	6.5	108.3
[e] G	do	Mallala	do	9.3	60	45.5	3.6	3.3	3.82	86.4	4.8	2.65	55.2	6.3	7.2	114.3
16	A. L. A	Oodnadatta	do	9.6	64	51	3.5	3.2	3.95	81	4.9	2.9	59.2	6.4	6.9	107.8
36	S. A. M. A	Umberatana	do					3.35	4.05	82.7	[1] 4.7	2.9	61.7	6.1	7	114.8
124	do	Cooper Creek	do	8.6				3.28	3.98	82.4	[18] 4.3	2.25	52.3			
234	do	Swanport	do	9.6	69	46	3.2	3.5	3.9	89.7	[18] 4.8	2.65	55.2	6.2	6.9	111.3
A_5	do	Near Adelaide	do	9.6	63	38	3.3	3.35	3.75	89.3	4.6	2.8	60.9	6.5	7.1	109.2
373	do	Fulham	do													
[f] H_3	do	Mypanya Jetty	do	9.3	67	46	3	3	3.52	85.2	[a] 4.9	2.5	51	5.9	6.5	110.2
	Dr. Pulleine's	Tailem Bend	do	9.4	71	53	3.4	3.25	3.9	83.3	4.9	2.7	55.1	6.3	6.8	107.9
[g] 26	S. A. M. A	Coorong	do	9.8	69	48.5		3.15	3.75	84	4.9	2.7	55.1	6.1	6.8	111.5
131	do	Tailem Bend	do	8.9	67	50.5		3.28	3.7	88.6	4.6	2.5	54.4	6	6.6	110
159	do	Morgan	do	9.1	66.5	50	3.5	3.38	3.95	85.6	[18] 4.7	2.75	58.5	6.4	7.2	112.5
[c] 11,458	do	Near Adelaide	do				3.35							6.3	7	111.1
369	do	Fulham	do													
I	do	do	do													
116	do	Coorong	do	9	64	47.5		3.2	4.05	79	[18] 5.05	2.5	49.6	6.5	[4] 6.2	95.4
225	do	Marion	do	10	63.5	43.5	3.5	3.62	3.82	94.8	5.05	2.5	49.5	6.5	7.3	112.3
308	do	Swanport	do	9.2	64	40	[5] 3.6	3.32	3.88	85.6	[18] 4.6	2.75	59.8	6.5	[4] 6.5	100
337	do	do	do				3.2	3.55	3.55	100	5.1	2.3	45.1	6.1	6.9	113.1
[c] 11,418	do	do	do	9.9	71.5	49	3.35	3.35	4.05	82.7	5.2	2.85	54.8	6.1	7.3	119.7
[h] 255	do	do	do	10.2				[19] 3.5	[19] 4	87.5	4.75	2.75	57.9	[4] 6.2	[4] 6.6	106.4
108	do	Walkerville	do	9.8	63.5			[20] 3.35	[20] 3.7	90.5	(18)					
M	do	Torren's Island	do	9.4	61	48	3.8	3.4	3.85	88.3	4.65	2.75	59.1	6.6	7	106.1
H_5	do	Murray Bridge	do	10	65.5	53	3.3	3.2	4.02	79.6	4.4	2.65	60.2	6.2	6.6	106.4
388	do	Mount Gambier	do													

9	A. L. A	Ardrossan	do	10.1	66.5	57.5	3.8	3.58	4.05	*88.5*	[18] 5.6	2.9	*51.8*	6.7	7.2	*107.5*
311	S. A. M. A	Swanport	do	9.6	72	52.5	[5] 3.5	[9, 19] 3.75	3.9	*96.2*	5.3	2.8	*52.8*	6.4	7	*109.4*
112	do	Hindmarsh Island	do	9.4	75.5	56		3.68	4.1	*89.8*	[18] 5.1	2.4	*47.1*	5.7	6.4	*112.8*
162	do	Morgan	do	10	65	56.5		3.5	[20] 3.8	*92.1*	5.05	2.8	*56.4*	6.6	7.1	*107.6*
237	do	Swanport	do	9.6	66.5	47.5	2.9	3.3	3.8	*86.8*	[18] 4.95	2.55	*51.5*	6.1	6.9	*113.1*
384	do	Sydenham, Torrens River	do	10.3	64	48.5		3.12	3.8	*82.1*	4.7	2.6	*55.3*	6.8	7.1	*104.4*
[4] A	do	Near Adelaide	do	9.4	73	60		3.05	3.7	*82.4*	[18] 4.8	2.35	*49*	5.9	6.6	*111.9*
[5] N	do	Coorong	do	9.6	59	45	3.5	[19] 3.5	[19] 4.3	*81.4*	[18] 5.4	2.55	*47.2*	6.8	6.7	*98.5*
C_2	Dr. Campbell's	Lower Murray River	do	9.8	63.5	50		2.98	3.65	*81.6*	[18] 4.7	2.5	*53.2*	6.6	6.8	*103*
80	S. A. M. A	Lake Alexandrina	do	9.4	68	50		3.28	3.9	*84.1*	5	2.7	*54*	6.4	[5] 6.4	*100*
298	do	Swanport	do	9.7	62	47	3.7	[19] 3.65	[19] 4	*91.2*	4.8	2.9	*60.4*	6.5	6.7	*103.1*
[8] H_{12}	do	Inkerman	do	9.4	74	63.5	[5] 3.4	3.25	3.68	*88.3*	4.15	2.45	*59*			
393	do	Coorong	do													
16,566	N. M. M	Lake Coorong	do													
99	S. A. M. A	Meningie	do					3.45	3.85	*89.6*	4.75	2.85	*60*	6.1	7	*114.8*
315	do	Swanport	do	9.8	63	52		[19] 3.2	[19] 3.65	*87.7*	[18] 4.7	2.85	*60.6*	6.5	7.6	*116.9*
[6] 11,450	do	Near Turnby Bay	do	9.8	67.5	51	3.3	3.32	3.88	*85.6*	5.15	2.7	*52.4*	6.1	6.9	*113.1*
	Dr. Basedow's	Collinsville	do	9.5	67.5	45.5	3.9	3.48	3.85	*90.4*	5	2.6	*52*	6.4	7.2	*112.5*
44	S. A. M. A	Near Adelaide	do	9.2	69	51		3.25	3.7	*87.8*	4.7	2.8	*59.6*	6.1	6.7	*109.8*
156	do	Milang	do	9			3.7	3.5	3.9	*89.7*	5.1	2.55	*50*			
238	do	Swanport	do	9.6	74	53	[9] 3.1	3.18	3.82	*83.2*	4.7	2.75	*58.5*	5.6	7	*125*
295	do	do	do	9.8	68.5	53	3	3.48	3.8	*91.6*	[18] 4.9	2.5	*51*	6.3	6.6	*104.8*
363	do	Fulham	do	9.4	69.5	61	3.5	[19] 2.6	[8, 19] 4	*65*	5.15	[5] 2.95	*57.3*	6.1	6.9	*113.1*
[4] 35	A. L. A	Glanville	do	9.4	68	40	3.4	3.42	3.85	*88.8*	[18] 5.2	2.7	*51.9*	6.2	6.7	*108.1*
C_4	Dr. Campbell's	Lower Murray River	do	9.8				3.48	4	*87*	5.15	2.75	*53.4*			
[5] 107	S. A. M. A	Plympton	do	10.4	61	48.5		3.55	3.6	*98.6*	[9] 4.75	2.6	*54.7*	6.8	6.9	*101.5*
161	do	Morgan	do	9.8	64	43.5		3.35	3.92	*85.5*	4.6	2.75	*59.8*	6.3	6.8	*107.9*
11	do	Parallana	do	8.4	73.5	52		3.55	3.9	*91*	5.1	2.45	*48*			
168	do	Clare	do	10.8	61	55		3.4	3.9	*87.2*	[18] 5.2	2.75	*52.9*	6.4	7	*109.4*
86	do	Coorong	do	9.6	68	54		3.18	3.8	*83.7*	[18] 4.95	2.4	*48.6*	6.1	6.7	*109.8*
11	A. L. A	do	do	8.8				3.4	3.65	*93.2*	4.8	2.45	*51*			
233	S. A. M. A	Swanport	do	9.9	68	50	3.2	3.35	3.85	*87*	4.9	2.65	*54.1*	6.1	6.7	*109.8*
292	do	do	do	9.4				3.4	3.8	*89.5*	5.06	2.7	*53.5*			
355	do	Fulham	do	9.4	78	58.5		3.65	3.9	*93.6*	5.1	2.5	*49*	[5] 5.9	[5] 6.3	*106.8*
415	do	Wood's Point, Murray River.	do	9.8	64	49	3.8	3.2	[20] 3.7	*86.5*	4.65	2.65	*57*	6.3	7	*111.1*
H_6	do	Coorong	do	9.3	68	58		3.35	3.9	*85.9*	4.8	2.5	*52.1*	6.2	6.7	*108.1*
15,897	N. M. M	Tailem Bend	do	9.4			3.9	[20] 3	[20] 3.9	*76.9*	5	2.8	*56*			
398	S. A. M. A	Near Moonta	do	9.2	61			3.28	3.9	*84.1*				[7] 6.1	6.6	*108.2*
T_{11}	do	Swanport	do	9.7	66.5	48		3.35	4.08	*82.1*	4.75	2.7	*56.8*	6.9	7.2	*104.4*
21	do	Murray River	do	9.6	67	49.5	3.7	3.2	4.05	*79*	4.55	3.05	*67*	6.4	7.4	*115.6*
138	do	Port Adelaide	do													
270	do	Swanport	do	9.3	70.5	40.5	2.9	3.58	3.85	*93*	[18] 5.3	2.65	*50*	6.1	6.6	*108.2*
273	do	do	do	9.1	66.5	48	3.2	3.22	3.75	*85.9*	[18] 4.75	2.35	*49.5*	6.1	6.7	*109.8*
[5] H_1	do	Tailem Bend	do													
3	A. L. A	Blinman	do	9	65.5	47	3.2	3.15	3.72	*84.7*	[18] 4.8	2.65	*55.2*			
304	S. A. M. A	Swanport	do	9.8	67	53		3.52	3.6	*97.8*	[18] 4.7	2.6	*56.3*	6.2	6.7	*108.1*
325	do	do	do	9.5	71	47	3.5	3.22	3.85	*83.6*	4.8	2.8	*58.3*	6.3	6.6	*104.8*
A_6	do	Near Adelaide	do													
283	do	Swanport	do	9.9	66.5	41		3.3	3.6	*91.7*	[18] 5	2.5	*50*	6.8	6.4	*94.1*
294	do	do	do	10	66.5	50	3.6	3.65	3.85	*94.8*	4.6	2.75	*59.8*	6.5	7	*107.7*

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 14.

SOUTH AUSTRALIAN CRANIA—Continued

MALE-Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
28	A. L. A	Loxton	Adult	9.2	65.5°	46°		3.45	4.1	*84.2*	[18] 4.95	2.85	*57.6*	6.3	7.1	*112.7*
H_4	S. A. M. A	Mypanya Jetty	do	9.5	66	47		2.92	3.55	*82.2*	4.5	2.5	*55.6*	6.4	6.4	*100*
22	do	Yorke Peninsula	do	9.2	60	41		3.35	3.85	*87*	4.8	2.6	*54.2*	6.5	6.2	*95.4*
[l] 262	do	Swanport	do	9	67	49	3.2	3.42	3.78	*90.5*	4.65	2.4	*51.6*	5.9	7.3	*123.7*
435	do	Waikerie	do	9.8	68.5	57		[19] 3.2	[19] 3.9	*82*	4.95	2.8	*56.6*	6.8	7.2	*105.9*
105	do	North West Bend	do	9				3.4	3.95	*86.1*	5	3	*60*			
[m] 11407	do	Balaklava	do				3.8	[20] 3.4	[20] 3.7	*91.9*	[18] 4.75	2.4	*50.5*	6.4	6.4	*100*
B_7	do	Meningie	do													
28923	N. M. M	Coorong	do	9.2	67.5	43		3.28	3.9	*84.1*	4.9	2.6	*53.1*	6.2	6.7	*108.1*
419	S. A. M. A	Robe	do	9.6	74	60		3.2	3.62	*88.4*	[18] 4.65	2.6	*55.9*	5.8	7.2	*124.1*
[e] 11416	do		do	9.4	69.5	57	3.5	3.6	4	*90*	5.15	2.5	*48.6*	5.9	6.5	*110.2*
39	A. L. A	Robe	do	8.9	74	56.5	2.9	3.35	3.98	*84.2*	[18] 4.65	2.5	*53.8*	5.7	6.8	*119.3*
[e] 4881	S. A. M. A		do	9.4	69.5	58.5	3.2	3.28	3.7	*88.6*	5	2.55	*51*	5.9	6.7	*113.6*
27	A. L. A	Wallaroo	do	10	63.5	49		3.4	3.9	*87.2*	[18] 4.8	2.7	*56.2*	6.8	7	*102.9*
119	S. A. M. A	Yorke Peninsula	do	9.3	60	50		3.32	3.85	*86.2*	5	2.5	*50*	6.2	6.8	*109.7*
250	do	Swanport	do	9	72.5	50		[19] 3.3	[19] 3.75	*88*	[18] 5.2	2.5	*48.1*	6	6.9	*115*
410	do	Yorke Peninsula	do	10.3	64.5	51	3.4	3.22	3.98	*80.9*	5	2.75	*55*	6.6	6.8	*103*
[e] 1368	do	Near Adelaide	do	9.2	64.5	47	3	[20] 3.5	[20] 3.75	*93.3*	5	2.6	*52*	6.6	6.7	*101.5*
37	A. L. A	Cobdojla	do	10.2	61	47	3.6	3.5	4.18	*83.7*	5.1	2.7	*52.9*	7.1	7.3	*102.8*
15955	N. M. M		do	10.8	64	46	4.3	3.32	4.22	*78.7*	4.9	3.1	*63.3*	7	7	*100*
84	S. A. M. A	St. Kilda	do	[a] 9.3	65.5	35.5		3.15	3.9	*80.8*	4.6	3	*65.2*	6.7	7.3	*109*
[f] 92	do	Coorong	do	9.8	69.5	65		3.4	3.8	*89.5*	5.2	2.6	*50*			
163	do	Port Augusta	Adolescent but all 3 molars erupted.	8.8	71	51		3.3	3.62	*91.2*	4.7	2.7	*57.4*	5.5	6.7	*121.8*
345	do	Swanport	Adult	9.6	68	50	3.3	3.28	3.9	*84.1*	4.75	2.8	*59*	6.3	7.1	*112.7*
[e] 369	do	Adelaide	do	9.8	65	49.5	[aa] 4.5	3.6	3.85	*93.5*	5.45	3.3	*60.6*	6.6	7.3	*110.6*
[e] 11410	do		do	9.2			3.4	3.52	3.95	*89.1*	5	3	*60*	[5] 6	6.9	*115*
A_4	do	Near Adelaide	do	9.6	73	55.5	3.1	3.18	4.08	*77.9*	[18] 4.9	3	*61.2*	6.3	7.1	*112.7*
B3495	A. M. S		do	9.4	64	55.5		3.3	4.2	*78.6*	4.9	2.8	*57.1*	6.1	6.8	*111.5*
16567	N. M. M		do	9.1	64	42	4	28.8	3.85	*74.8*	4.55	2.75	*60.4*	6.6	7.4	*112.1*
30	S. A. M. A	Port Lincoln	do	9.2	66.5	43.5		3.25	3.7	*87.8*	4.9	2.8	*57.1*	6.4	6.5	*101.6*

236	do	Swanport	do	9.2	70	51		3.45	3.9	88.5	4.95	2.6	5.25	6	6.2	103.3
254	do	do	do					3.32	3.78	87.8	[18] 4.75	2.55	53.7	6.4	6.6	103.1
257	do	do	do	9.2	65	53	3.4	3.18	3.68	86.4	4.95	2.7	54.6	6.3	6.9	109.5
[4] 570	do	Near Needles	do													
H_8	do	Near Adelaide	do	9.1	66.5	46		2.92	3.75	77.9	4.4	2.7	61.4	6.3	6.4	101.6
258	do	Swanport	do	8.6	69	48.5		[19] 3.45	[19] 3.65	94.5	5	2.55	51	6	6.6	110
H_9	do	Meningie	do	9.6	62	51	3.4	3.25	3.9	83.3	4.7	2.95	62.8			
102	do	Murray Bridge	do	9.2	73	50		35.5	[5, 20] 3.8	93.4	[18] 4.9	2.5	51	5.7	6.1	107
309	do	Swanport	do	9	74	56.5	3.4	[20] 3.65	[20] 3.85	94.8	[18] 4.85	2.55	52.6	5.8	6.4	110.3
16	do	Streaky Bay	do	9.6	66.5	43.5		3.45	4.05	85.2	5.05	2.5	49.5	6.4	6.8	106.2
35	do	Goolwa	do	8.8	70.5	52.5		3.4	4.1	82.9	4.7	2.6	55.3	5.7	6.6	115.8
157	do	Lake Albert	do	[5] 9	69.5	42		3.45	4.05	85.2	4.45	2.6	58.4	6.4	6.1	95.3
288	do	Swanport	do	9	69	53.5	3.35	3.28	3.7	88.6	4.85	2.5	61.5	5.7	6.7	117.5
63	do	Lake Alexandrina	do	9.2	70.5	61		3.3	3.6	91.7	4.8	2.6	54.2	6	6.9	115
155	do	Milang	do	9.4	63	38.5	3.5	3.12	3.85	81	4.8	2.7	56.2	6.3	7.2	114.3
396	do	Coorong	do	8.4	63.5	46	3.6	3.48	3.9	89.2	4.5	2.7	60	[5] 6.2	6.4	103.2
3075	do	Glenely	do	9.2	66.5	49	3.4	3.4	3.9	87.2	4.7	2.45	52.1	6.5	6.3	96.9
S	do	Coorong	do				3.4	[19] 3.55	[19] 4	88.8	5.05	2.55	50.5			
28928	N. M. M.	do	do	9.2	67	50.5		3.38	3.9	86.7	5.05	2.65	52.5	5.9	7.3	123.7
231	S. A. M. A.	do	do	9.6	66	53		[19] 3.4	[19] 3.8	89.5	4.7	2.5	53.2	6.8	[5] 6.8	100
336	do	Swanport	do	9	71	48	3.2	3.3	3.78	87.3	[18] 4.3	2.5	58.1	5.7	6.3	110.5
434	do	Waikerie	do	10.2	63	48		[20] 3.2	[20] 4	80	4.9	3.05	62.3			
H_{13}	do	Murray Bridge	do													
411	do	Ardrossan	do				[5, 21] 3.4	3.42	3.95	86.6	5.3	2.6	49.1	6.7	7.1	106
418	do	Woods Point	do				3.35				[18] 4.4	2.55	58			
420	do	Meningie	do	9.4	69.5	56	3	3.35	3.88	86.3	5	2.6	58	6.1	6.4	104.9
120	do	Oodnadatta	do	9.1	67	45		3.55	4.05	87.6	[18] 5.4	2.85	52.8	6.7	[bb] 7.7	114.9
287	do	Swanport	do	8.8	69	56	3.5	3.4	3.8	89.5	5	2.6	52	[cc] 5.9	6.9	117
	Dr. Campbell's	Eyres Peninsula	do	9.7	64	56	3.4	3.3	3.95	83.6	[18] 5.05	2.45	48.5	6.5	6.4	98.5
101	S. A. M. A.	Plympton	do													
	Dr. Campbell's	Yorke Peninsula	do													
318	S. A. M. A.	Swanport	do					3.55	3.9	91	5.2	2.35	45.2	6.2	7.1	114.5
389	do	Mingbool, S. E.	do	9.1	73.5	54	3.1	3.1	3.75	82.7	4.25	2.95	69.4			
405	do	Tailem Bend	do	8.9	67.5	47		3.25	3.95	82.3	[18] 4.9	2.9	59.2	5.9	6.7	113.6
436	do	Waikerie	do	9.2	70	58		3.42	4.05	84.4	[18] 4.85	2.8	57.7			
282	do	Swanport	do	9.2	70	55		3.42	3.55	96.3	4.8	2.35	49	5.8	6.4	110.3
24	A. L. A.	Port Elliot	do	9.5	69	52	3.6	3.32	4.1	81	4.9	2.7	55.1	6.2	7	112.9
232	S. A. M. A.	Murray Bridge	do				3.6	(22)						6.4	7.1	110.9
28	do	Coorong	do	8.8	68	45		3.55	4.15	85.5	5.3	2.65	50	6.3	6.95	110.3
3079	do	Lake Bonnie	do	8.8	71	48		3.22	3.9	82.6	4.45	2.85	64	5.9	7	118.6
160	do	Morgan	do	9.6	72	53		3.48	3.98	87.4	4.95	2.7	54.6	[5] 6.1	7.3	119.7
208	do	North of Mount Eba	do	9.1	64	47.5	[21] 3.3	3.62	4.02	90	5.6	3.3	58.9	[5] 6.4	7.3	114.1
394	do	Coorong	do	8.8	67	49	3.4	3.12	3.9	80	[18] 4.3	2.25	52.3	5.9	6.9	117
29	do	do	do	9.1	69	50.5		3.25	3.9	83.3	4.65	2.2	47.3	6.3	6.7	106.4
[9] 226	do	Tailem Bend	do	9.2	70.5	31	3.8	3.22	3.85	83.6	5.5	2.7	49.1	5.8	6.9	119
A_2	do		do	8.4	67	48		3.25	3.85	84.4	[18] 4.7	2.65	56.4			
Z	do	Near Eucla	do	9				3.1	3.8	81.6	4.9	3	61.2			
114	do	Lake Albert	do	9.4	65	51		3.32	3.9	85.3	4.7	2.75	58.5	6.2	6.7	108.1
	Dr. Campbell's	Near Adelaide	Near adult	8.9	66.5	51.5		[19] 3	[19] 3.6	83.3	4.4	2.55	58	6	6.8	110
[8] 395	S. A. M. A.	Coorong	Adult	8.9	67.5	49.5	2.9	3.25	[5] 3.7	87.8	[18] 4.7	2.45	52.1			
60	do	Murray River	do	8.4	69	50		3.22	3.82	84.3	4.6	2.4	52.2	[5] 5.5	6.3	114.6

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 14.

SOUTH AUSTRALIAN CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
					°	°										
310	S. A. M. A.	Swanport	Adult	9.7	66	45	3.4	3.35	3.85	*87*	[15] 4.8	2.65	*55.2*	6.5	6.5	*100*
C2	Dr. Campbell's	Lower Murray River	Near adult	9.4	------	------	------	3.4	3.68	*92.4*	4.8	2.7	*56.2*	6	6.9	*115*
[c] 1036	S. A. M. A.	Ardrossan	Adult	9.3	66	45.5	------	3.52	3.85	*91.4*	4.95	2.55	*51.5*	6.3	6.7	*106.4*
4	Dr. Campbell's	Lower Murray River	do.	9.2	65	54	------	3.38	3.45	*98*	4.6	2.55	*55.4*	6	6.3	*105*
[r] 425	S. A. M. A.	Cournamont	do.	9.4	70	60	3	3.48	4.08	*85.3*	4.7	3.15	*67*	6	7.2	*120*
400	do.	Coorong	do.	8.6	68.5	51	3.5	3.58	3.8	*94.2*	5	2.65	*53*	5.9	7	*118.6*
Totals				(160) 1,565.4	(160) ------	(150) ------	(92) 316.5	(176) 589.22	(176) 680.38	(176) ------	(176) 854.45	(176) 469.6	(176) ------	(187) 981.9	(187) 1,072.26	(187) ------
Averages				*9.43*	*67*	*50*	*3.44*	*3.35*	*3.86*	*86.8*	*4.85*	*2.67*	*55*	*6.25*	*6.83*	*109.3*
Minima				8.4	59	31	2.8	2.6	3.52	*65*	4.1	2.2	*45.1*	5.5	6.1	*94.1*
Maxima				10.8	78	63.5	4.5	3.8	4.3	*100*	5.8	3.3	*69.4*	7.2	8	*125*

[a] No allowance made for wear in any case.
[b] Damaged.
[c] Whole skeleton.
[d] Some bones.
[e] Very short alveolar process.
[f] Skeleton indicates a small male.
[g] Very massive; parietal thick; about 6.8 mm.
[h] Damaged.
[i] Surely male.
[j] Basion gone; estimated from height to border of foramen magnum behind condyle.
[k] Both lower median incisors, both upper median incisors, and right upper lateral incisor missing.
[l] Slightly female-like, but probably male.
[m] Part of skeleton.
[n] Base of auditory meatus line to bregma.
[o] All teeth lost in lower jaw. Right upper median incisor missing.

NOTE.—For footnotes to reference figures see p. 3.

[p] Supraorbital ridges and orbits look female-like, but surely male.
[q] Lower jaw female-like, but skull male.
[r] Massive.
[s] Lower jaw has very square chin.
[t] Nasal cavity proper; great prenasal fossae, but in the nose.
[u] Internal nose; external nose=5.15.
[v] Left=3.35; slight injury to bone over left orbit, but effect questionable.
[w] Lower jaw receding.
[x] To line of gutters=5.3.
[y] Round smooth tumor in palate; big hole.
[z] Very prognathic; lower jaw a trace receding.
[aa] Lower jaw has no menton prominence; vertical when standing, sloping backward when in position.
Very thick alveolar process adjoining molars.
Alveolar arch square in front.

NORTHERN TERRITORY CRANIA

MALE

Catalogue [a] No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
195	S. A. M. A.	Anson Bay	Adult	19.6	12.1	13.4	*61.7*	*84.8*	15.03	[3] 11.7	7.4	13.7	*85.4*	*54*	11.6	10.5
115	do	Tennant Creek	do	19.4	12.1	13.3	*62.4*	*84.2*	14.93	[24] 12.2	[5,12] 7.3	13.1	*93.1*	*55.7*	[1] (10.8)	10.9
138	do		do	19.5	12.4	14.1	*63.6*	*88.1*	15.33	[7] 11.4	7.2	14	*81.4*	*51.4*	11	10.3
[a] 176	do	Anson Bay	do	18.2	11.6	13.4	*63.7*	*89.3*	14.40	[4] 10.6	6.3	13	*81.6*	*48.5*	10.8	10.5
79	do	MacDonnell Ranges	do	20	12.8	13.6	*64*	*82.9*	15.47		------	------	------	------	10.5	10.3
16115	N. M. M.		do	19.9	12.8	13.6	*64.3*	*82.9*	15.43	[3] 11.9	7.4	[5] 13.7	*86.9*	*54*	11	10.6
3080	S. A. M. A.	Melville Island	do	18.2	11.8	13	*64.8*	*86.7*	14.33	[9] 11.4	6.9	13	*87.7*	*53.1*	10.3	10.3
	Dr. Basedow's	Arnhem Land	do	19.6	12.8	13	*65.3*	*80.2*	15.13	[4] 11.7	6.8	13.7	*85.4*	*49.6*	10.5	9.8
122	S. A. M. A.	Melville Island	do	19.5	12.8	14	*65.6*	*86.4*	15.43	[3] 11.3	7	13.8	*81.9*	*50.7*	10.9	10.9
129	do	do	do	18.4	12.1	13.7	*65.8*	*90.1*	14.73	[3] 10.9	6.4	13.4	*81.3*	*47.8*	10.6	10.3
181	do	Anson Bay	do	18.8	12.4	13.4	*66*	*85.9*	14.87	[4] 11.5	7.1	12.7	*90.6*	*55.9*	10.8	10.4
18507	N. M. M.		do	18.7	12.4	13.9	*66.3*	*89.1*	15	------	[5,13] 6.4	13.5	------	*47*	------	10.4
16128	do		do	19	12.6	13.1	*66.3*	*82.9*	14.90	------	------	13.6	------	------	------	11.1
135	S. A. M. A.		do	19.3	12.9	14.4	*66.8*	*89.4*	15.53	[3] 12.1	7.3	14.1	*85.8*	*51.8*	10.6	10.9
136	do		do	19.4	13	13.2	*67*	*81.6*	15.20	[10] 11.3	7.1	14.1	*80.1*	*50.4*	10.9	10.6
214	do	Barroloola	do	20.6	13.8	14.4	*67*	*83.7*	16.27	------	[1,13] (7.7)	15	------	*(51.3)*	------	11.2
[a] 16377	N. M. M.		do	18.2	12.2	13.5	*67*	*88.8*	14.63	------	------	13.6	------	------	------	10.6
142	S. A. M. A.		do	18.3	12.3	13.5	*67.2*	*88.2*	14.70	[3] 11.5	7	13.4	*85.8*	*52.2*	10.9	10.7
428	do	Melville Island	do	18.6	12.5	13.6	*67.2*	*87.2*	14.90	[9] 11.8	7.3	12.6	*93.6*	*57.9*	9.8	9.9
130	do	do	do	18.7	12.6	------	*67.4*	------	------	------	6.4	13.1	------	*48.8*	------	------
194	do	Anson Bay	do	18.4	12.4	14.1	*67.4*	*91.6*	14.97	[4] 11.1	6.6	13.7	*81*	*48.2*	10.1	10.2
203	do	do	do	18.7	12.6	13.2	*67.4*	*84.6*	14.83	[13] 11.1	6.9	13.6	*81.6*	*50.7*	11.4	10.6
5	A. L. A.		do	18.7	12.6	13.4	*67.4*	*85.9*	14.90	[8] 11.5	6.9	12.7	*90.6*	*54.3*	9.6	10.4
16359	N. M. M.		do	18.6	12.6	13.2	*67.7*	*84.6*	14.80	[3] 10.9	[5] 6.7	13.8	*79*	*49.6*	11.1	10.7
191	S. A. M. A.	Anson Bay	Near adult	18.4	12.5	13.9	*67.9*	*90.3*	14.93	[8] 11.1	[5] 6.9	12.4	*80.6*	*55.6*	11	10.4
56	do		do	18.8	12.8	12.6	*68.1*	*79.8*	14.73	------	[5] 6.7	12.9	------	*51.9*	10.1	9.9
[a] 230	do	Rosewood Downs	do	18.8	12.8	13.1	*68.1*	*82.9*	14.90	------	6.9	13.6	------	*50.7*	10	10.2
17063	N. M. M.		do	18.2	12.4	13.7	*68.1*	*89.5*	14.77	[3] 11.9	[6] 7.4	13.5	*88.2*	*54.8*	10.6	10.3
16132	do		do	18.2	12.4	13.6	*68.1*	*88.9*	14.73	[3] 11.2	6.9	13.3	*84.2*	*51.9*	11.1	10.2
28727	do	East Alligator River	do	19.1	13	13.9	*68.1*	*86.9*	15.33	------	7.3	13.7	------	*53.8*	10.9	10.4
17084	do		do	18.6	12.7	13.6	*68.3*	*87.2*	14.97	------	------	13.3	------	------	------	10.2
7	S. A. M. A.	Newcastle Waters	do	18.4	12.6	13.3	*68.5*	*85.8*	14.77	------	------	13.1	------	------	------	10.6
378	do	Melville Island	do	17.8	12.2	12.8	*68.5*	*85.3*	14.27	[4] 10.3	6.4	13	*79.2*	*49.2*	9.3	9.4

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 21.

NORTHERN TERRITORY CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
28732	N. M. M	East Alligator River	Near adult	18.4	12.6	14	*68.5*	*90.3*	15		7.4	13.9		*53.9*	10.6	10.7
137	S. A. M. A		do	18.9	13	13.2	*68.8*	*82.5*	15.03	[7] 11.8	7.2	13.7	*86.1*	*52.6*	11.2	10.5
207	do	Anson Bay	do	18.3	12.6	13.2	*68.8*	*85.7*	14.70		7.3	13.4		*54.5*	11.1	10.6
[4] 229	do	Melville Island	do	18.3	12.6	13	*68.8*	*84.4*	14.63	[4] 10.6	6.4	12.7	*83.5*	*50.4*	10.4	10
• 16370	N. M. M		do	18.6	12.8	14	*68.8*	*89.2*	15.13	[4] 11.2	6.6	13.9	*80.6*	*47.5*	11.5	10.8
16108	do		do	18.6	12.8	13.4	*68.8*	*85.4*	14.93	[25] 12.1	7	13.6	*89*	*51.2*	10.9	10.1
• 16374	do		do	18	12.4	13.2	*68.9*	*86.8*	14.53	[3] 10.6	6.2	12.8	*82.8*	*48.4*	10.8	10.6
6	S. A. M. A	Daly River	do	17.4	12	13.6	*69*	*92.5*	14.33		7	12.8		*54.7*	10.4	10
19488	N. M. M		do	19	13.1	14	*69*	*87.5*	15.37	[3] 11.4	7.1	14	*81.4*	*50.7*	11	10.6
429	S. A. M. A	Melville Island	do	19.1	13.2	14.4	*69.1*	*88.9*	15.57	[7] 11.5	6.9	13.8	*88.3*	*50*	11	10.4
16369	N. M. M		do	17.8	12.3	14.2	*69.1*	*94.7*	14.77	[4] 11.7	7.1	13.6	*86*	*52.3*	11	10.6
[1] 134	S. A. M. A		do	18.8	13	13.8	*69.2*	*86.8*	15.20	[11] 12.3	7.2	13.7	*89.8*	*52.6*	10.6	10.1
427	do	Melville Island	do	18.8	13	13.6	*69.2*	*85.5*	15.13	[4] 12.2	[3] 7.7	14.8	*82.4*	*58*	10.8	10.9
16123	N. M. M		do	18.8	13	13.8	*69.2*	*86.8*	15.20	[3] 10.3	6	13.6	*75.7*	*44.1*	11	10.7
• 11443	S. A. M. A	McArthur River	do	19.2	[5] 13.3	14.4	*69.3*	*88.9*	15.63	[7] 11.5	7.2				11.3	11
141	do		do	18	12.5	13	*69.4*	*85.5*	14.50	[3] 10.6	6.3	13.6	*77.9*	*46.3*	10.6	10.4
377	do	Melville Island	do	18.4	12.8	12.6	*69.6*	*80.8*	14.60	[3] 10	6.2	14.4	*69.4*	*43.1*	10.8	10.3
16122	N. M. M		do	18.4	12.8	13.6	*69.6*	*87.2*	14.93	[4] 12	7.4	13.4	*89.6*	*55.2*	10.8	10.5
15958	do	Hassan River	do	18.8	13.1	14	*69.7*	*87.5*	15.30	[3] 11.5	7	14.1	*81.6*	*49.6*	10.5	10.7
62	S. A. M. A	Borroloola	do	19.2	13.4	14.4	*69.8*	*88.3*	15.67	[13] 11.5	7	[1] 14.4	*79.9*	*48.6*	10.6	10.1
19489	N. M. M		do	19.2	13.4	13.9	*69.8*	*85.3*	15.50	[7] 11.9	7.7	13.9	*85.6*	*55.4*	10.4	10.1
[10] 28719	do	East Alligator River	do	(18.6)	(13)	(13.2)	*(69.9)*	*(85.5)*	14.93		6.5	13.9		*46.8*	10.1	10.1
9	S. A. M. A	Port Essington	do	18.3	12.8	13.4	*70*	*85.9*	14.83	11.3	6.7	[5] 12.7	*89*	*52.8*	9.7	9.8
152	do		do	18	12.6	13	*70*	*85*	14.53	[10] 11	6.6	12.3	*89.4*	*53.7*	10.3	9.9
184	do	[9] Anson Bay	do	18.3	12.8	13.7	*70*	*87.8*	14.93	[10] 11.1	7	[5] 13.7	*81*	*51.1*	10.8	11
• 376	do	Melville Island	do	18	12.6	13	*70*	*85*	14.53	[4] 10.8	6.7	13.3	*81.2*	*50.4*	10.1	9.8
16105	N. M. M		do	18.5	13	14.2	*70.3*	*89.9*	15.23	[4] 11	6.8	14	*78.6*	*48.6*	11.8	10.6
28722	do	East Alligator River	do	19	13.4	13.7	*70.5*	*84.6*	15.37		7.5	14		*53.6*	10.7	10.4
66	S. A. M. A	Port Darwin	do	18	12.7	13	*70.6*	*84.4*	14.57		6.5	13.4		*48.5*	10.8	9.7
74	do	Bowen's Straits	do	18.4	13	13.9	*70.6*	*88.5*	15.10	[4] 11.7	6.9	13.5	*86.7*	*51.1*	10.8	10.2
186	do	Anson Bay	do	18	12.7	12.8	*70.6*	*83.1*	14.50	[10] 9.9	[13] 5.9	13.2	*75*	*44.7*	10.8	10.6
16116	N. M. M		do	18.4	13	12.9	*70.6*	*82.2*	14.77	[7] 11.5	6.8	14	*82.1*	*48.6*	10.3	10.4
Q	S. A. M. A	MacDonnell Ranges	do	18.8	13.3		*70.7*									
16379	N. M. M		do	18.8	13.3	13.9	*70.7*	*86.9*	15.33	[4] 11.8	7.1	13.9	*84.9*	*51.1*	9.6	10.2

140	S. A. M. A.		do.	18.5	13.1	[5] 13.6	70.8	86.1	15.07	[11] 10.5	6.1	13.4	78.4	45.5	10.3	10.2
78	do.	MacDonnell Ranges	do.	18.3	13	13.4	71	85.9	14.90		7.4	[5] 13.7		51	10	10.2
202	do.	Anson Bay	do.	18.6	13.2	13.3	71	83.6	15.03	[4] 10.9	7	13.9	78.4	50.4	11.4	10.7
9	A. L. A.		do.	18.6	13.2	13	71	81.8	14.93	[7] 11.2	7	13.3	84.2	52.6	10.7	10.5
128	S. A. M. A.	Melville Island	do.	18	12.8	13.2	71.1	85.7	14.67	[3] 10.1	[f] 5.9	13.5	74.8	43.7	[1] 10.4	10
8	do.	Adelaide River	do.	17.7	12.6	13.3	71.2	87.5	14.53	10.8	6.6	13	83.1	50.8	10.1	10.1
[b] 211	do.	Borroloola	do.	19.2	13.7	14.7	71.4	89.6	15.87		6.9	13.6		50.7	10.4	10.1
16112	N. M. M.		do.	18.5	13.2	13.8	71.4	87.3	15.17	[25] 11.4	6.9	13.7	83.2	50.4	11.6	10.9
[a] 16373	do.		do.	17.9	12.8	13.7	71.5	89	14.80	[4] 10.7	6.5	13.1	81.7	49.6	10.9	10.3
185	S. A. M. A.	Anson Bay	do.	18.3	13.1	13.6	71.6	86.6	15	[3] 11.4	6.8	13.6	85.8	50	10.6	10.3
10	A. L. A.		do.	19.4	13.9	13.5	71.6	81.3	15.60		7.7				10.1	10.4
[1] 133	S. A. M. A.		do.	18.4	13.2	13.5	71.7	85.4	15.03	[3] 11	6.8	13.6	80.9	60	11.3	10.3
17067	N. M. M.		do.	18.8	13.5	13.8	71.8	85.2	15.37		[6] 7.2	13.7		52.6	10.6	10.2
A5114	A. M. S.	Port Darwin	do.	18.1	13	14.6	71.8	93.6	15.23		7.1	[m] 13.5		52.6	10.5	10.4
60	S. A. M. A.	Victoria River	do.	18.5	13.3	13.2	71.9	83	15	[10] 11.8	[145] 7.1	[5] 13.7	86.1	51.8		9.8
[a] 77	do.	MacDonnell Ranges	do.	19.2	13.8	13.3	71.9	80.6	15.43	[10] 11.3	(13)	14.3	79			10.8
17081A	N. M. M.		do.	19.2	13.8	14.4	71.9	87.3	15.80	[7] 12	7.4	12.9	93	57.4	10.1	10.4
[a] 218	S. A. M. A.	Borroloola	do.	18.9	13.6	12.4	72	76.5	14.97		(13)	14				10.4
205	do.	Anson Bay	do.	18.6	13.4	13.3	72	83.1	15.10							10.6
139	do.		do.	18.3	13.2	13.6	72.1	86.1	15.03	[10] 11.7	7.4	14.4	81.2	51.4	11.2	11.1
178	do.	Anson Bay	do.	18.3	13.2	13.2	72.1	83.5	14.90	[10] 11	7.1	14.3	76.9	49.6	10.6	10.3
16372	N. M. M.		do.	17.9	12.9	13.2	72.1	85.7	14.67	[4] 11.1	6.7	13.2	84.1	50.8	11	10.2
16117	do.		do.	[k] 18.1	13.1	13.6	72.4	87.2	14.93	[4] 10.9	7	14.1	77.3	49.6	10.8	10.5
16127	do.		do.	18.5	13.4	13.4	72.4	83.8	15.10	[3] 11.2	6.8	13.7	81.8	49.6	11	10.7
[a] 28717	do.	East Alligator River	do.	17.4	12.6	13.4	72.4	89.3	14.47	[27] 11.5	7	13.5	85.2	51.8	10.3	9.9
5	S. A. M. A.	Charlotte Waters	do.	18.2	13.2	12.7	72.5	80.9	14.70			[3] 13.6				9.8
19487	N. M. M.		do.	18.6	13.5	13.8	72.6	86.2	15.30	[7] 10.6	6.7	13.3	79.7	50.4	10	10.2
43	A. L. A.		do.	18.7	13.6	12.9	72.7	79.6	15.07	[9] 11.4	6.7	13	87.7	51.5	9.9	9.8
16125	N. M. M.		do.	17.8	13	13.3	73	86.4	14.70	[3] 10.2	6.1	13.3	76.7	45.9	10.6	10
85	S. A. M. A.	Malay Bay	do.	17.5	12.9	13.3	73.7	87.5	14.57	[7] 11.3	6.8	13.4	84.3	50.8	10.4	10
375	do.	Melville Island	do.	18.4	13.6	13.7	73.9	85.6	15.23							9.6
183	do.	Anson Bay	do.	17.7	13.1	14.4	74	93.5	15.07	[4] 11.6	7.1	[5] 13.1	88.6	54.2	10.3	10.5
16106	N. M. M.		do.	18	13.4	13.5	74.4	86	14.97	[4] 10.7	6.5	13.6	78.7	47.8	10.6	10
13033	do.	Daly River	do.	17.7	13.2	13	74.6	84.4	14.63		7.2	14.1		51.1	11.1	10.3
55	S. A. M. A.	Newcastle waters	do.	17.5	13.1	13.4	74.9	87.6	14.67	10.8	6.5	13	83.1	50	10.1	9.9
[26] 61	do.		Near adult	(17.6)	(13.2)	(14.2)	(75)	(92.2)	(15)	[6] 11.2	6.7	12.6	88.9	53.2	10.8	10.6
72	do.	Port Darwin	Adult	18	13.6	13.2	75.6	83.5	14.93	[10] 10.6	6.7	13.2	80.3	50.8	10.6	9.7
67	do.	Victoria River	do.	17.9	13.6	13.1	76	88.9	14.87	[3] 11.1	(13)	13.3	85.5			9.9
[26] 16367	N. M. M.		do.	(17.7)	(13.6)	(14)	(76.8)	(89.7)	(15.10)	[3] 12	7.4	13.6	88.2	54.4	10.8	10.8
A5113	A. M. S.	Port Darwin	do.	(17.1)	(14.6	(13.6)	(85.4)	(86.1)	(15.10)		7.1	13.3		53.4	[5] 10.3	10.1
[f] P	S. A. M. A.	MacDonnell Ranges	do.								7.7					
Totals				(103) 1,910.3	(103) 1,328.9	(101) 1,365.6	(103)	(102)	(101)	(78) 877.2	(95) 655.4	(101) 1,365.8	(77)	(96)	(91) 968.4	(103) 1,066.6
Averages				18.55	12.9	13.52	69.6	86	14.99	11.25	6.9	13.52	83.2	51	10.64	10.35
Minima				17.4	11.6	12.4	61.7	76.5	14.27	9.9	5.9	12.3	69.4	43.1	9.6	9.4
Maxima				20.6	13.9	14.7	76	94.7	16.27	12.3	7.7	15	93.6	57.4	11.8	11.1

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 21.

NORTHERN TERRITORY CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal index* $\left(\frac{b \times 100}{l}\right)$
					°	°										
195	S. A. M. A.	Anson Bay	Adult	10.2	62.5	50	3.7	3.15	3.75	84	5	2.75	55	6.8	6.9	101.5
115	do	Tennant Creek	do	9.6	(71)	(52)		3.75	4.1	91.5	5.2	2.95	56.7	[1] (6.4)	6.7	104.7
138	do		do	9.6	65	48		3.42	3.7	92.4	5	2.8	56	6.7	7	104.5
176	do	Anson Bay	do	9.6	70.5	49.5	3.1	[10] 3.1	[10] 3.7	83.8	4.45	2.7	60.7	5.8	6.5	112.1
79	do	MacDonnell Ranges	do	9.4				3.5	4.2	83.3	4.65	2.6	55.9			
16115	N. M. M.		do	9.9	67	58	3.5	3.2	3.7	86.5	4.95	2.7	54.6	6.4	7.3	114.1
3080	S. A. M. A.	Melville Island	do	9.2	70.5	51.5	3.2	3.12	3.8	82.1	5.05	2.7	53.5	6	6.8	113.3
	Dr. Basedow's	Arnhem Land	do	9.4	65	54.5	3.8	3.18	4	79.5	4.7	2.65	56.4	6.2	6.5	104.8
122	S. A. M. A.	Melville Island	do	9.9	71.5	58		2.9	3.95	73.4	4.9	2.8	57.1	6.2	6.9	111.3
129	do	do	do	[3] 9.4	70	48		3.15	3.72	84.7	4.7	2.6	55.3	6.1	6.5	106.6
181	do	Anson Bay	do	9.2	68	44	3.45	3.42	4.08	83.8	5	2.65	53	6.1	6.4	104.9
18507	N. M. M.		do	9.6				3.05	3.9	78.2	4.7	2.7	57.4			
16126	do		do	9.6			3.5	2.9	3.95	73.4	[7] 4.8	2.8	58.3			
135	S. A. M. A.		do	9.4	72.5	54		3.45	4.1	84.2	5.1	2.65	52	6.1	6.3	103.3
136	do		do	9.6	68.5	51		3.28	3.95	83	4.95	2.75	55.6	6.5	7.2	110.8
214	do	Borroloola	do	9.9				3.2	4.35	73.6	5.35	3	56.1			
16377	N. M. M.		do	9.9				3.25	3.9	83.3	[18] 5.25	2.85	54.3			
142	S. A. M. A.		do	9.3	69.5	46		3.48	3.85	90.4	4.8	2.5	52.1	6.3	7.1	112.7
428	do	Melville Island	do	8.5	69	50.5	3.65	3.68	4.08	90.2	5.15	2.8	54.4	5.8	6.4	110.3
130	do	do	do					3.5	3.78	92.6	4.6	2.6	56.5	6	6.3	105
194	do	Anson Bay	do	9.8	72	75.5	3.5	3.05	3.75	81.3	[18] 4.8	2.75	57.3	6.5	6.8	104.6
203	do	do	do	10.2	65.5	51	3.5	3	3.95	76	4.85	2.85	58.8	6.3	6.8	107.9
5	A. L. A.		do	8.8	76	59	3.2	3.5	3.65	95.9	5.2	2.8	53.8	5.7	6	106.3
16359	N. M. M.		do	10.1	69	54.5	3.5	3.08	3.85	80	4.85	2.85	58.8	6.3	6.9	109.5
191	S. A. M. A.	Anson Bay	Near adult	9.8	66.5	53	3.2	3.55	3.7	95.9	4.7	2.5	53.2	6	6.8	113.3
56	do		Adult	9.6	68.5	69		3.05	3.9	78.2	4.8	2.3	47.9	6.6	7.3	110.6
230	do	Rosewood Downs	do	9	72	52.5		3.58	4.1	87.3	[18] 5.2	2.95	56.7	5.8	6.7	115.5
17083	N. M. M.		do	9.2	67	50	3.8	3.4	3.85	88.3	[18] 5.05	2.55	50.5	6.4	6.8	106.2
16132	do		do	9.4	64	40	3.4	3.3	3.85	85.7	4.85	2.6	53.6	6.4	6.6	103.1
28727	do	East Alligator River	do	9.6	66.5	49		3.65	4.05	90.1	5.2	3.05	58.6	6.4	6.9	107.8
17084	do		do	9.2				3.18	3.75	84.8	4.8	2.6	54.2			
7	S. A. M. A.	Newcastle waters	do	9				3.72	4.15	89.6	4.9	2.85	58.2	([2])		
378	do	Melville Island	do	8.8	67	56.5	3	3.12	3.68	84.8	4.3	2.6	60.5	5.9	6.3	106.8

28732	N. M. M	East Alligator River	do	9.4	70.5	52.5		3.7	4.1	*90.2*	5.3	2.8	*52.8*	6.3	6.6	*104.8*
137	S. A. M. A		do	10	65.5	53.5		3.4	3.65	*93.2*	4.9	2.3	*46.9*	6.3	7.4	*117.5*
207	do	Anson Bay	do	9.8	67	52		3.5	3.8	*92.1*	5.05	2.8	*55.4*	6.4	6.9	*107.8*
229	do	Melville Island	do	9.3	68.5	50	3.2	2.85	3.58	*79.6*	[18] 4.7	2.9	*61.7*	6.1	6.6	*108.2*
16370	N. M. M		do	10.2	67	41	3.4	3.18	3.95	*80.5*	[18] 5	2.95	*59*	6.2	7	*112.9*
16106	do		do	9.4	64.5	44.5	3.5	3.15	3.6	*87.5*	4.9	2.65	*54.1*	6.3	6.7	*106.4*
16374	do		do	9.7	71.5	47	3.15	3.18	3.75	*83.2*	[18] 4.7	2.65	*56.4*	5.8	6.5	*112.1*
6	S. A. M. A	Daly River	do	9	67	50		3.25	3.72	*87.4*	4.65	2.6	*55.9*	6.1	6.25	*102.5*
19488	N. M. M		do	9.9	68	53.5	3.4	3.65	4.28	*85.3*	5.1	2.85	*55.9*	6.3	7.1	*112.7*
429	S. A. M. A	Melville Island	do	9.6	67	45	3.45	3.4	4.08	*83.3*	4.95	2.85	*57.6*	6.2	7.1	*114.5*
16369	N. M. M		do	9.6	67.5	46	3.7	3.45	3.9	*88.5*	[18] 5.1	2.7	*52.9*	6.3	6.5	*103.2*
134	S. A. M. A		do	9.6	66	56		3.35	3.9	*85.9*	5.1	2.8	*54.9*	6.2	6.9	*111.3*
427	do	Melville Island	do	9.7	70	56	3.4	3.92	4.62	*84.8*	5.5	3	*54.6*	[3] 6.3	7.3	*115.9*
16123	N. M. M		do	9.8	71	43.5	3.2	3.15	4.05	*77.8*	[18] 4.5	2.9	*64.4*	6.3	6.8	*107.9*
11443	S. A. M. A	McArthur River	do	10	69	51	3.3	3.18	3.98	*79.9*	5.1	2.65	*52*	6.5	6.5	*100*
141	do		do	9.8	71	53.5		3.55	4	*88.8*	[18] 4.85	2.6	*53.6*	6	6.6	*110*
377	do	Melville Island	do	10	68.5	55	[5 14] 3	3.08	3.9	*79*	[18] 4.7	3.1	*66*	6	6.8	*113.3*
16122	N. M. M		do	9.8	68	59	3.5	3.6	3.9	*92.3*	5.1	2.65	*52*	6.2	6.9	*111.3*
15968	do	Hassan River	do	9.4	72.5	54	3.4	3.28	4	*82*	[18] 5	3.2	*64*	6.1	6.7	*109.8*
62	S. A. M. A	Borroloola	do	9.2	66.5	48		3.25	4	*81.2*	4.8	2.8	*58.3*	6.5	7.1	*109.2*
19489	N. M. M		do	9.2	66	56.5	3.4	3.7	4.05	*91.4*	[18] 5.05	2.45	*48.5*	6.3	6.8	*107.9*
28719	do	East Alligator River	do	9.1	71.5	51		3.45	4.05	*85.2*	[18] 4.9	3.05	*62.2*	5.7	6.7	*117.5*
9	S. A. M. A	Port Essington	do	[5] 8.6	71	54.5		3.2	3.7	*86.5*	4.6	3	*65.2*	5.7	6.8	*119.3*
152	do		do	9	68	49	3.4	3.22	3.85	*83.6*	4.6	2.5	*54.4*	6	6.3	*106*
184	do	Anson Bay	do	9.6	73	48.5	3.5	[19] 3.6	[19] 3.8	*94.7*	5.3	2.95	*55.7*	6.2	[5] 6.9	*111.3*
376	do	Melville Island	do	9.2	68	58.5	3	3.25	3.9	*83.3*	4.7	2.8	*59.6*	5.8	6.1	*105.2*
16105	N. M. M		do	10.6	63	52.5	3.45	2.82	3.6	*78.3*	4.6	2.7	*58.7*	6.7	7	*104.5*
28722	do	East Alligator River	do	9.3	67	48.5		3.55	4.05	*87.6*	5.3	2.6	*49.1*	6.1	7.2	*118*
66	S. A. M. A	Port Darwin	do	9.4	62.5	45		3.15	3.85	*81.8*	4.5	2.7	*60*	6.1	6.9	*113.1*
74	do	Bowen's Straits	do	9.5	66.5	50		3.25	4	*81.2*	4.8	3	*62.5*	6.2	6.8	*109.7*
186	do	Anson Bay	do	9.9	72.5	56.5	2.85	3.05	3.82	*79.8*	[18] 4.2	2.9	*69*	5.8	6.7	*115.5*
16116	N. M. M		do	9	72	47.5	3.3	3.15	3.9	*80.8*	4.9	2.4	*49*	5.6	6.5	*116.1*
Q	S. A. M. A	MacDonnell Ranges	do					[19] 3	[19] 3.9	*76.9*						
16379	N. M. M		do	8.4	74	50	3.1	3.4	3.9	*87.2*	[18] 5.2	3	*57.7*	5.7	6.9	*121*
140	S. A. M. A		do	9.4	72	55		2.98	3.78	*78.8*	4.4	2.55	*58*	6.1	6.7	*109.8*
78	do	MacDonnell Ranges	do	8.7	70	52.5		3.35	3.92	*85.4*	5.1	2.7	*52.9*	5.8	6.4	*110.3*
202	do	Anson Bay	do	10.2	66.5	49	3.05	3.35	3.95	*84.8*	5.15	2.8	*54.4*	6.3	6.4	*101.6*
9	A. L. A		do	9.4	69	50	3.3	3	3.95	*76*	4.9	2.6	*53.1*	6.3	6.6	*104.8*
123	S. A. M. A	Melville Island	do	9.4	70	48		3.08	3.85	*80*	[18] 4.45	2.65	*59.6*	[1] 5.9	6.5	*110.2*
8	do	Adelaide River	do	8.8	71	45		3.5	3.9	*89.7*	4.9	2.65	*54.1*	6	6.4	*106.7*
211	do	Borroloola	do	9	68	50.5		3.1	3.85	*80.5*	4.55	2.55	*56*	6.3	7	*111.1*
16112	N. M. M		do	10.4	67	46	3.2	3.4	4.02	*84.6*	[18] 5.22	2.7	*51.9*	6.7	6.9	*103*
16373	do		do	9.6	67	46	3.3	3.2	3.85	*83.1*	4.65	2.9	*62.4*	5.9	6.4	*108.5*
185	S. A. M. A	Anson Bay	do	9.2	69	45	3.35	2.92	3.68	*79.3*	4.9	2.85	*58.2*	5.9	7.1	*120.3*
10	A. L. A		do	9.2	70	61.5		3.42	[5] 3.9	*87.7*	5.3	2.55	*48.1*	6.5	6.2	*95.4*
133	S. A. M. A		do	10.2	64	53.5		3.12	3.68	*84.8*	[18] 4.75	2.6	*54.7*	6.7	6.9	*103*
17087	N. M. M		do	9.4	67	52.5		3.42	4.15	*82.4*	5.05	[5] 3	*59.4*	6.2	7.1	*114.5*
A5114	A. M. S	Port Darwin	do	9.2	69.5	49.5		3.1	3.7	*83.8*	[18] 5.1	2.75	*53.9*	6.3	6.7	*106.4*
60	S. A. M. A	Victoria River	do	8.8				3.22	3.9	*82.6*	[8] 4.65	2.8	*60.2*	[5] 6.4	7.3	*114.1*
77	do	MacDonnell Ranges	do					3.58	4.2	*85.2*	4.7	2.8	*59.6*	[5] 6.8	7.2	*105.9*

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 21.

NORTHERN TERRITORY CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
17081A	N. M. M.		Adult	9.1	71	59	3.4	3.45	3.92	*88*	[18] 5.1	2.65	*52*	6	6.5	*108.3*
• 218	S. A. M. A.	Borroloola	do	9				3.98	4.2	*94.8*	5.1	2.75	*53.9*			
205	do	Anson Bay	do					3.35	3.92	*85.5*	5.15	2.85	*55.3*			
139	do		do	10.2	70	59.5		3.2	4.02	*79.6*	5.06	2.95	*58.4*	6.3	6.7	*106.4*
178	do	Anson Bay	do	9.4	68	52	3.6	3.55	3.88	*91.5*	[18] 5.06	2.6	*51.5*	6.1	[5] 6.4	*104.9*
16372	N. M. M.		do	9.6	65.5	42	3.2	3.68	3.95	*93.2*	4.9	2.95	*60.2*	6.2	6.3	*101.6*
16117	do		do	9.6	68.5	50.5	3	3.25	3.9	*83.3*	5	2.8	*56*	6.3	6.7	*106.4*
16127	do		do	10	69.5	57		3.28	3.82	*85.9*	4.7	3.1	*66*	6.4	7	*109.4*
• 28717	do	East Alligator River	do	9.3	67	56	3.2	3.42	3.8	*90*	[18] 5	2.6	*52*	5.9	6.5	*110.2*
5	S. A. M. A.	Charlotte Waters	do					3.42	4	*85.5*	4.96	2.75	*55.6*	(29)	(29)	(29)
19487	N. M. M.		do	9	72.5	52	3	3.45	3.8	*90.8*	5	2.8	*56*	5.8	6.8	*117.2*
43	A. L. A.		do	8.6	69.5	45.5	3.3	3.5	3.9	*89.7*	[18] 4.96	2.55	*51.5*	5.6	6.6	*117.9*
16125	N. M. M.		do	9.5	67.5	47	3.1	3.2	3.85	*83.1*	4.55	2.65	*58.2*	5.9	6.5	*110.2*
85	S. A. M. A.	Malay Bay	do	8.8	67.5	44.5		2.85	3.88	*73.4*	[18] 4.65	2.8	*60.2*	5.9	6.3	*106.8*
375	do	Melville Island	do				[5] 3.2									
183	do	Anson Bay	do	9	71.5	50	3.2	3.35	3.72	*90*	5.1	2.5	*49*	6	6.8	*113.3*
16106	N. M. M.		do	9.4	67	52.5	3.5	3.08	3.8	*81*	4.35	2.25	*51.7*	6	6.5	*108.3*
13093	do	Daly River	do	9.6	64.5	46.5		3.32	3.9	*85.1*	[18] 4.95	2.8	*56.6*	6.3	6.8	*100*
55	S. A. M. A.	Newcastle waters	do	8.9	69.5	49.5		3.42	3.98	*85.9*	4.65	3.15	*67.7*	5.9	6.9	*117*
[28] 61	do		Near adult	9.6	70.5	53		3.4	3.75	*90.7*	4.65	2.6	*55.9*	6	6.7	*111.7*
72	do	Port Darwin	Adult	9.1	63.5	43		3.38	3.92	*86.2*	4.7	2.8	*59.6*	6.2	6.6	*106.4*
67	do	Victoria River	do	9.1				3.52	3.95	*89.1*	5.2	2.75	*52.9*	[5] 6.3	6.6	*104.8*
[28] 16367	N. M. M.		do	9.7	70	57	3.6	3.7	4.15	*89.2*	[18] 5.2	2.45	*47.1*	5.9	6.5	*110.2*
A5113	A. M. S.	Port Darwin	do	9	68	51		3.55	[5] 3.7	*95.9*	4.9	2.45	*50*	5.6	6.9	*123.2*
[f] P	S. A. M. A.	MacDonnell Ranges	do					3.52	3.98	*88.4*	5.25	2.9	*55.2*	6.4	7	*109.4*
Totals				(101) 954.1	(90)	(90)	(54) 180.1	(107) 355.28	(107) 417.89	(107)	(106) 519.3	(106) 290.5	(106)	(96) 584.7	(96) 645.45	(96)
Averages				*9.45*	*68.5*	*51*	*3.34*	*3.32*	*3.9*	*85.1*	*4.9*	*2.74*	*55.9*	*6.15*	*6.72*	*109.3*
Minima				8.4	62.5	40	2.85	2.82	3.58	*73.4*	4.2	2.25	*48.9*	5.6	6	*96.4*
Maxima				10.6	74	69	3.8	3.98	4.62	*95.9*	5.5	3.2	*69*	6.8	7.4	*123.2*

[a] Surely male.
[b] All teeth present.
[c] All stained red (ocher).
[d] Slightly femalelike, but male.
[e] Tribe Marra Nungga.
[f] Massive.
[g] Whole skeleton.

[h] Prominent supramastoid crests—largest ever seen.
[i] Lateral incisors shovel shaped; medians show trace.
[j] Both upper and lower median incisors knocked out.
[k] Very heavy parietal (8–9 mm.).
[l] Very heavy parietal (7–9 mm.).
[m] Zygomatic processes very thick.
[n] Heavy, low type.

[o] Colored with red ocher.
[p] 2 mm. discounted for crest.
[q] Face normal.
[r] Moderate intranasal shelves.
[s] Upper incisors broken out.
[t] Moderate intranasal shelves.
[u] Nasal border distinct.

NOTE.—For footnotes to reference figures see p. 3.

VICTORIA CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt.(x)	Basion-Nasion (y)
12909	N. M. M.	Loddon and Little Murray Rivers.	Adult	20.4	13.3	14.6	65.2	86.9	16.10	[4] 13.4	8.3	14.5	92.4	57.2	11.6	10.8
18333	do	Lake Boga	do	20.1	13.2	14.7	65.7	88.6	16.10	[7] 12.4	7.8	14.2	87.3	54.9	11.1	10.7
16214	do	Near Ararat	do	19.8	13.2	13.8	66.7	83.6	15.60	[3] 11.6	7.2	[5] 13.6	85.3	52.9	11.3	10.9
84	A. L. M.		do	19.4	13.1	14	67.5	86.4	15.50		7.2	14.1		51.1	10.8	10.9
13305	N. M. M.		do	20.3	13.7	13.5	67.5	79.4	15.83		7.1				11.3	11.2
12912	do	Loddon and Little Murray Rivers.	do	19.4	13.1	14.2	67.5	87.6	15.57		7	14.2		49.3	11.4	10.9
12994	do	Near Swan Hill	do	19.1	12.9	[3] 13.7	67.5	85.6	15.23	[7] 11.3	6.5	[5] 13.3	85	48.9	10.8	10.4
22	A. L. M.		do	19.8	13.4	14.2	67.7	85.5	15.80		7.5	13.9		54	11.3	10.9
13004	N. M. M.	Wannon River	do	19.3	13.1	13.4	67.9	82.7	15.27		7.2	13.3		54.1	10.7	10.7
12822	do	Mortlake	do	20	13.6	13.4	68	79.8	15.67		7.7	14.1		54.7	[5] 11.1	[5] 11
13010A	do	Near Koondrook	do	19.1	13	13.4	68.1	83.8	15.17	[3] 11.1	7.2	13.2	84.1	54.6	10.7	10.4
16212	do	Warinambool	do	19.2	13.1	13.7	68.2	84.6	15.33		6.9	14		49.3	10.8	10.2
14319A	do	Strathmarton	do	19.8	13.5	14.3	68.2	86.1	15.87	[9] 12.1	(13)	13.4	90.3			10.6
13007A	do	Near Koondrook	do	19.2	13.1	13.9	68.2	85.8	15.40	[4] 10.4	6.1	13.7	75.9	44.5	10.9	10.5
74	A. L. M.		do	19.2	13.1	13.6	68.2	84	15.30		[6] 7.2	13.8		52.2	11.2	10.9
83	do		do	19.8	13.6	13.7	68.7	82	15.70		(13)	13.9				10.1
A10799	A. M. S.		do	18.6	[5] 12.8	13	68.8	82.8	14.80		6.9	12.7		54.3	10.6	10
1245	do	Port Fairy	do	20.8	14.3	13.2	68.8	75	16.10		7.1	14.8		48	11	10.5
13300	N. M. M.	Kerung	do	19.2	13.2	13.6	68.8	84	15.33		7	14.4		48.6	11	10.5
16229	do	Torres Strait (?)	do	19.1	13.2	13.8	69.1	85.2	15.37		7.5	13.8		54.4	11	10.4
12861	do	Kerung	do	19.4	13.4	14.3	69.1	87.2	15.70	[10] 10.7	[5, 11] 6.8	14	76.4	48.6	10.9	10.6
16215	do	Numutkah	do	18.8	13	13	69.2	81.8	14.93	[3] 11.7	[5, 13] 7.3	13.6	86	53.7	11	10.7
13006A	do	Near Koondrook	do	19.8	13.7	14.5	69.2	86.3	16	[3] 11.6	7.2	14.2	81.7	50.7	11.3	10.7
82	A. L. M.		do	18.8	13	13.2	69.2	83	15	[4] 11.3	6.9	12.7	89	54.3	9.8	9.7
16211A	N. M. M.	Lake Boga	do	19.3	13.4	14.4	69.4	87.8	15.70	[3] 11.2	[5] 7.3	14.5	77.2	50.3	11.3	11.1
12736	do	Swan Hill	do	18.6	12.9	13.5	69.4	85.4	15	[4] 12.3	7.4	13.8	89.1	53.6	10.8	10
49	A. L. M.		do	18.6	12.9	13.6	69.4	86.1	15.03	[7] 11.7	7.1	13.4	87.3	53	10.4	10.3
13034	N. M. M.	Near Wicliffe	do	19	13.2	13.8	69.5	85.7	15.33		7.1				10.4	10.3
48	A. L. M.		do	19.4	13.5	12.8	69.6	78	15.23			14.4				10.6
14323	N. M. M.	Mortlake	do	19.5	[5] 13.6	14.3	69.7	86.1	15.80		7.2	14		51.4	10.7	10.7
13298	do	Wimmera district	do	19.2	13.4	13.9	69.8	85.3	15.50		7.3	13.4		54.5	10.4	10.1
18500	do	Koondrook	do	18.6	13	13	69.9	82.5	14.87	[3] 9.6	6.1	[1] 13.7	70.1	44.5	10.9	9.8
12738	do	Murrabit	do	18.6	13		69.9			[4] 10.9	7	13.8	79	50.7		

12964	do	Hamilton	do	19	13.3	13.6	70	84	15.30	(a)	[5] 7.4	14.1		52.5	[5] 11.4	11.3
19830	do	Mortlake	do	19.4	13.6	13.8	70.1	83.6	15.60		7.3	14		52.1	11.8	10.7
13126A	do	Jung Jung	do	19.4	13.6	14.6	70.1	88.5	15.87	[10] 11.5	7.2	14	82.1	51.4	11.4	11
13000	do	Jones Creek	do	18.8	13.2	13.5	70.2	84.4	15.17		6.9	[5] 14.6		47.3	10.3	10.3
29519	do	Natimuk	do	19.8	13.9	13.6	70.2	81	15.77	[10] 10.7	6.8	13.9	77	48.9	11.4	10.5
18501	do	Koondrook	do	18.5	13	13.6	70.3	86.1	15.03	[7] 10.3	6.2	13.7	75.2	45.3	10.6	9.7
45	A. L. M.		do	19.2	13.5	14.2	70.3	86.6	15.63	[4] 11.1	7	13.9	79.9	50.4	10.9	10.3
14324	N. M. M.	Hexham	do	19	13.4	14	70.5	86.4	15.47		(e)	[5] 13.7				10.4
• 12859	do	Kerung	do	19.3	13.6	13.5	70.5	82.3	15.47		7.3	14.7		49.7	10.2	10.5
12907	do	Loddon and Little Murray Rivers.	do	19	13.4	13.7	70.5	84.6	15.37	[7] 12.2	7.4	13.8	88.4	53.6	11.3	10.3
A	do	Rockwood	do	19.4	13.7	14	70.6	84.3	15.70	[3] 11.5	7.1	[5] 13.4	85.8	53	10.7	10.2
• 32	A. L. M.		do	18.7	13.2	12.9	70.6	80.6	14.93	[4] 11.7	7.3	13.3	88	54.9	10.9	10.4
30	do		do	19.2	13.6	13.7	70.8	83.5	15.50	[3] 11.7	7.3	13.3	88	54.9	11.1	10.5
76	do		do	18.9	13.4	14.2	70.9	87.6	15.50		7.2	12.9		55.8	10.6	10.8
19828	N. M. M.	Mortlake	do	18.6	13.2	13.5	71	84.9	15.10		[5] 7.1				10.8	10.1
[b] 18509	do	Koondrook	do	18	12.8	13.5	71.1	87.7	14.77	[3] 11.3	7.1	14.2	79.6	60	10.9	10.6
12976	do	Loddon and Murray Rivers	do	19.4	[1] 13.8	14	71.1	84.3	15.73		7.1				11.1	10.5
3	A. L. M.		do	19.6	14	13.4	71.4	79.8	15.67		7.1	14.6		48.6	11.1	10.5
28921	N. M. M.		do	19	13.6	14.4	71.6	88.3	15.67			13.3				10.2
12960	do	Lower Wimmera	do	18.4	13.2	13.2	71.7	83.5	14.93	[4] 11.7	7.1	13.3	88	53.4	10	10
94	A. L. M.		do	19.2	13.8	[5] 14.1	71.9	85.4	15.70		7.3	13.8		52.9	11.3	11.5
53	do		do	19	13.7	13.5	72.1	82.3	15.40	[4] 10.3	[5, 6] 6.1	14.1	73	43.3	10.4	10.1
14325	N. M. M.	Hexham	do	19.4	14	14.2	72.2	85	15.87		7.6	14.7		51.7		11.3
12868	do	Myall	do	18	13	13.8	72.2	89	14.93	[4] 11.6	6.8	13.7	84.7	49.6	10.6	10.2
12908	do	Reedy Creek	do	18.8	13.6	13	72.3	80.2	15.13		6.8	14.4		47.2	10.3	9.9
43	A. L. M.		do	19.4	14.1	13.8	72.7	82.1	15.77		7.5	[5] 14.7		51	10.5	10.4
87	do		do	18.7	13.6	13.5	72.7	83.3	15.27	[4] 11.6	7.2	13.9	83.4	51.8	11	10.5
6	do		do	18.7	13.6	13.4	72.7	82.7	15.23		7.2	[5] 13.8		52.2	10.6	10.3
80	do		do	18.7	13.6	13.4	72.7	82.7	15.23	[30] 10.9	[5] 7.2				10	10.6
28924	N. M. M.	Sweet Creek	do	18.8	13.7	12.8	72.9	79	15.10		7.5	[5] 13.7		54.7	10.8	10.3
• 12740A	do	Hopetown	do	18.1	13.2	13.4	72.9	85.9	14.90	[27] 11.2	7.1	13.5	83	52.6	10.6	10.1
12996	do	Barwon River, Geelong	do	18.9	13.8	13.6	73	82.9	15.43		7.2	14.2		50.7	10.4	10.2
92	A. L. M.		do	19.4	14.2	14.4	73.2	85.7	16	[4] 11	[5, 6] 6.4	14.1	78	45.4	10.5	9.9
[d] 13008A	N. M. M.	Near Koondrook	do	18.6	13.7	13.6	73.7	84	15.30	[9] 10.7	6.5	14.1	75.9	46.1	10.3	10.1
70	A. L. M.		do	18.6	13.7	13.6	73.7	84	15.30		[5, 6] 7.2	13.6		52.9	10.2	9.9
42	do		do	18.4	13.6	13.4	73.9	83.8	15.13	[10] 11.3	7.5	14.1	80.1	53.2	10.9	10.3
18503	N. M. M.	Koondrook	do	18.8	14	(e)	74.5			[10] 11.6	[5, 31] 7.3	14.2	81.7	51.4		
25436	do	Appolo Bay	do	18.2	13.6	12.9	74.7	81.1	14.90	[10] 10.6	6.5	14	75.7	46.4	10.6	10.3
38	A. L. M.		do	18.2	13.6	12.7	74.7	79.9	14.83	[10] 11.2	7.2	13.4	83.6	53.7	10.4	10.2
9	do		do	18.4	14.2	13.6	77.2	83.4	15.40		[f] (6.7)	[5] 14.8		45.3		10.5
• 15210A	N. M. M.	Echued	do	18.1	14.1	13.2	77.9	82	15.13	[10] 11.1	[h, 5] 7.1	[5] 14	79.3	50.7	10.6	10.2
Totals				(74) 1,412.2	(74) 994.9	(72) 984.8	(74)	(75)	(73)	(38) 430.1	(68) 483.2	(69) 957.9	(27)	(59)	(65) 703	(72) 752.7
Averages				19.08	13.44	13.68	70.4	84.1	15.40	11.32	7.11	13.88	82.3	51.2	10.82	10.45
Minima				18	12.8	12.7	65.2	75	14.77	9.6	6.1	12.7	70.1	43.3	9.8	9.7
Maxima				20.8	14.3	14.7	77.9	89	16.10	13.4	8.3	14.8	92.4	57.2	11.8	11.5

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 25.

VICTORIA CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal index* $\left(\frac{b}{l}\right)$
					°	°										
12909	N. M. M.	Loddon and Little Murray Rivers.	Adult	10.2	63	57	4.1	3.58	3.85	*93*	5.05	2.7	*53.5*	7	7.6	*108.6*
18333	do	Lake Boga	do	9.8	66.5	55.5	3.6	3.32	3.9	*85.1*	5.1	2.9	*56.9*	6.7	7.3	*109*
16214	do	Near Ararat	do	10.1	68.5	55.5	3.9	[19] 3.15	[19] 4	*78.7*	4.9	3	*61.2*	6.8	7.4	*108.8*
84	A. L. M.		do	9.6	72	54.5		3.58	3.8	*94.2*	5	3	*60*	6	6.7	*111.7*
13305	N. M. M.		do	10.1	71			[19] 3.2	[19] 4	*80*				6.3	6.9	*109.5*
12912	do	Loddon and Little Murray Rivers.	do	10	68	49.5		3.38	3.9	*86.6*	4.8	2.8	*58.3*	6.6	7	*106.1*
12994	do	Near Swan Hill	do	9.6	69	51.5	3.7	2.95	3.6	*81.9*	4.45	2.6	*58.4*	6.3	6.6	*104.8*
22	A. L. M.		do	10.3	68	61		3.22	3.92	*82.2*	[4] 5	2.95	*59*	6.5	6.6	*101.5*
13004	N. M. M.	Wannon River	do	9.6	70	56	3.7	3.35	3.68	*91*	[4] 5	3.05	*61*	6.1	6.7	*109.8*
12822	do	Mortlake	do	[5] 9.7	69	52					5.2	2.9	*55.8*	6.3	6.9	*109.5*
13010A	do	Near Koondrook	do	9.6	68	56	[5] 3.3	3.48	3.85	*90.4*	4.9	2.5	*51*	6.3	6.8	*107.9*
16212	do	Warinambool	do	9.7	66	55		3	3.8	*78.9*	[4] 4.8	2.8	*58.3*	6	7.4	*123.3*
14319A	do	Strathmarton	do	9.4			3.9	3.38	4	*84.5*	4.7	3.1	*66*			
13007A	do	Near Koondrook	do	9.9	70	52	3.2	2.95	4.05	*72.8*	4.4	2.7	*61.4*	5.9	7.2	*[illegible]*
74	A. L. M.		do	9.9	69	53.5		3.48	4	*87*	4.8	2.85	*59.4*	[6] 6.6	6.7	*101.5*
83	do		do	9.4				3.52	4.12	*85.4*	4.7	2.8	*59.6*			
A10799	A. M. S.		do	9.4	66	52		2.98	3.58	*83.2*	4.8	2.85	*59.4*	6.3	6.6	*104.8*
1245	do	Port Fairy	do	9.9	67	56		3.12	4.15	*75.2*	[4] 4.9	3.05	*62.2*	6.3	7.1	*112.7*
13300	N. M. M.	Kerung	do	9.6	67.5	47.5	3.5	2.98	3.78	*78.8*	4.9	2.9	*59.2*	6.5	7.6	*116.9*
16229	do	Torres Strait (?)	do	9.6	65	52		3.4	4.1	*82.9*	5	2.7	*54*	6.4	7.5	*117.2*
12861	do	Kerung	do	9.6	69.5	47	3.8	3.3	3.9	*84.6*	4.9	3.05	*62.2*	6.1	7	*114.8*
16215	do	Numutkah	do	9.5	68	45.5	3.7	3.15	3.8	*82.9*	[18] 5.2	2.85	*54.8*	6.2	6.8	*109.7*
13006A	do	Near Koondrook	do	9.9	66.5	49	3.7	3.15	3.95	*79.8*	[8] 5	2.75	*55*	6.6	7.1	*107.6*
82	A. L. M.		do	8.4	69	51	3.35	3.48	4.02	*86.6*	[18] 4.55	2.65	*58.2*	5.9	6	*101.7*
16211A	N. M. M.	Lake Boga	do	10.2	69.5	57	3.4	3.18	3.75	*84.8*	4.95	2.9	*58.6*	6.1	7	*114.8*
12736	N. M. M.	Swan Hill	do	9.4	63	49	3.9	3.5	4.02	*87.1*	5.1	2.6	*51*	6.7	7	*104.5*
49	A. L. M.		do	9.4	69.5	57.5	3.5	3.48	3.95	*88.1*	5	2.6	*52*	6.1	6.8	*111.5*
13034	N. M. M.	Near Wicliffe	do	9.4	69.5	56					5.1	2.55	*50*			
48	A. L. M.		do					[19] 3.35	[19] 4.15	*80.7*						
14323	N. M. M.	Mortlake	do	9.6	70.5	56.5		3.5	3.95	*88.6*	4.9	2.65	*54.1*	6.3	6.7	*106.4*
13298	do	Wimmera district	do	9.3	67	55		3.45	3.85	*89.6*	5.1	2.7	*52.9*	6	7	*116.7*
18500	do	Koondrook	do	9.7	63	46	3.2	3.08	3.82	*80.6*	4.35	3	*69*	6.2	6.8	*109.7*
12738	do	Murrabit	do				3.2	[20] 3.15	[20] 3.8	*82.9*	4.75	2.4	*50.5*	6	7	*116.7*

12964	do	Hamilton	do	10	70.5	49	[e] 3.6	3.38	4.3	*78.6*	5.25	2.7	*51.8*	6.4	6.9	*107.8*
19830	do	Mortlake	do	10	63	44		3.52	4.1	*85.8*	4.8	2.75	*57.3*	6.8	[f] 6.9	*101.5*
13126A	do	Jung Jung	do	10.1	68.5	52	4	3.35	3.95	*84.8*	4.9	2.9	*59.2*	6.6	7.5	*113.6*
13000	do	Jones Creek	do	9.4	70	60.5		3.25	4.15	*78.3*	4.7	2.65	*56.4*	5.9	6.8	*115.2*
29519	do	Natimuk	do	10.3	65	56.5	3.4	3	3.9	*76.9*	4.5	3	*66.7*	6.4	7	*109.4*
18501	do	Koondrook	do	9.4	64.5	42.5	3.3	3.3	3.62	*91.2*	4.6	2.8	*60.9*	5.9	6.7	*113.6*
45	A. L. M.		do	9.4	66.5	47.5	3.7	3.25	3.95	*82.3*	4.75	2.9	*61.1*	6.3	7.1	*112.7*
14324	N. M. M.	Hexham	do	9.8				3.32	3.98	*83.4*	[18] 4.7	2.55	*54.2*			
[a] 12859	do	Kerung	do	9.3	71.5	60.5		3.9	4	*97.5*	5.15	2.55	*49.5*	5.6	6.2	*110.7*
12907	do	Loddon and Little Murray Rivers.	do	9.8	63	48.5	3.7	3.32	3.85	*86.2*	5	3	*60*	6.5	7.1	*109.2*
A	do	Rockwood	do	9.6	66.5	56.5	4	3.28	3.95	*83*	4.8	2.6	*54.2*	6.5	7.5	*115.4*
[a] 32	A. L. M.		do	9.8	67	58	3.5	3.45	3.9	*88.5*	[i] 4.95	2.85	*57.6*	6.1	7.1	*116.4*
30	do		do	9.7	66	51	3.6	3.38	3.9	*86.7*	4.85	2.7	*55.7*	6.4	6.6	*103.1*
76	do		do	9.4	72	56		3.45	4	*86.2*	[j] 4.85	2.85	*58.8*	6.1	6.7	*100.8*
19828	N. M. M.	Mortlake	do	9.4	65	49.5	3.8	3.32	3.9	*85.1*	4.8	2.75	*57.3*	6.4	[f] 6.9	*107.8*
[b] 18509	do	Koondrook	do	9.9	68.5	55.5	3.2	3.7	4	*92.5*	5.2	3.25	*62.5*	6	6.8	*113.3*
12976	do	Loddon and Murray Rivers	do	9.9	66.5	50		3.52	3.88	*90.7*	5.15	2.85	*55.3*	6.3	7.6	*120.6*
3	A. L. M.		do	9.9	66.5	53		3.32	4.02	*82.6*	4.95	2.8	*56.6*	6.3	7.1	*112.7*
28921	N. M. M.		do	8.4				3.55	3.95	*89.9*	[18] 4.9	2.85	*58.2*			
12960	do	Lower Wimmera	do	8.8	69	51.5	3.2	3.22	3.6	*89.5*	[18] 5	2.75	*55*	5.8	6.5	*112.1*
94	A. L. M.		do	10.2	73	56.5		3.3	3.95	*83.6*	5.1	2.6	*51*	5.9	6.4	*108.5*
53	do		do	9.4	70	53.5	3.5	3.05	3.9	*78.2*	[18] 4.3	2.85	*66.3*	[f] 5.8	6.9	*119*
14325	N. M. M.	Hexham	do	10.1				3.3	3.95	*83.6*	5.1	2.6	*51*	[f] 6.6	7.4	*112.1*
12863	do	Myall	do	9.2	67.5	49.5	3.8	[19] 3.2	[19] 4	*80*	[13] 4.55	2.55	*56*	6.1	6.8	*111.5*
12908	do	Reedy Creek	do	9.2	67	52		3.42	3.78	*90.5*	4.9	3	*61.2*	6.1	6.6	*108.2*
43	A. L. M.		do	9.4	68	56.5		3.65	4.05	*90.1*	5.25	2.75	*52.4*	6.2	7.2	*116.1*
87	do		do	9.8	67	54	3.7	3.2	3.88	*82.5*	[m] 4.95	3.05	*61.6*	6.3	6.8	*107.9*
6	do		do	9.3	68	53		3.4	4.05	*84*	4.8	2.65	*55.2*	6.6	7	*106.1*
80	do		do	9.2	74	63.5	3.4	[19] 3.05	[19] 3.7	*82.4*	4.95	2.25	*45.5*			
28924	N. M. M.	Sweet Creek	do	9.4	65.5	54		3.42	3.9	*87.7*	4.75	2.85	*60*	6.6	6.9	*104.6*
[a] 12740A	do	Hopetown	do	9.4	66	54.5	3.4	3.12	3.8	*82.1*	4.7	2.5	*53.2*	5.8	6.4	*110.3*
12906	do	Barwon River, Geelong	do	9.3	68	56.5		3.28	3.89	*84.6*	4.85	2.6	*53.6*	6.1	6.5	*106.6*
92	A. L. M.		do	9.3	67	49.5	3.4	3.5	4	*87.5*	4.5	2.8	*62.2*	5.8	6.4	*110.3*
[d] 13008A	N. M. M.	Near Koondrook	do	9.1	70	49	3.05	3.4	3.7	*91.9*	4.65	2.6	*55.9*	5.9	6.5	*110.2*
70	A. L. M.		do	8.8	67	48	3.5	3.38	3.95	*85.6*	[18] 5.1	2.7	*52.9*	6	6.7	*111.7*
42	do		do	9.6	65	51.5	3.55	3.38	4.1	*82.4*	5.2	3	*57.7*	6.1	7	*114.8*
18503	N. M. M.	Koondrook	do				4	3.48	4	*87*	5.1	3.05	*59.8*	[f] 6.4	7	*109.4*
25436	do	Appolo Bay	do	9.6	69.5	53.5	3.5	3.08	3.8	*81.1*	4.7	2.7	*57.4*			
38	A. L. M.		do	9.2	68	52.5	3.2	3.35	4	*83.8*	5.05	2.95	*58.4*	6.1	7	*114.8*
9	do		do	9.6				3.2	4	*80*	4.75	2.85	*60*			
[a] 15210A	N. M. M.	Echued	do	9.4	67	51	3.6	[19] 3.35	[19] 4.1	*81.7*	5.1	2.85	*55.9*	6.1	7	*114.8*
Totals				(71) 680.6	(64)	(64)	(48) 153.25	(72) 239.08	(72) 282.43	(72)	(72) 351.45	(72) 200.65	(72)	(66) 405.9	(66) 449.3	(66)
Averages				*9.59*	*67.5*	*52.5*	*3.56*	*3.32*	*3.92*	84.7	*4.88*	*2.79*	57.2	*6.24*	*6.91*	110.8
Minima				8.4	63	42.5	3.05	2.95	3.58	*72.8*	4.3	2.25	*45.5*	5.6	6	*101.5*
Maxima				10.3	74	63.5	4.1	3.9	4.3	*97.5*	5.25	3.25	*69*	7	7.6	*123.3*

[a] Atypical. [b] Premature occlusion of sagittal suture but no scaphocephaly. [c] Whole skeleton. [d] Surely male. [e] Fairly high.
[f] Alveolar point absorbed; measurement was more. [g] Aberrant type, but full blood. [h] Right upper median incisor missing; left broken.
[i] Large intranasal fossae. [j] Asymmetrical. [k] Asymmetrical; medium intranasal shelves. [l] Moderate intranasal fossae.
[m] Well-marked intranasal shelves. NOTE.—For footnotes to reference figures see p. 3.

NEW SOUTH WALES CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
423	S. A. M. A.	Moorna	Adult	20.3	13.1		*64.5*			[3] 11.7	7.2	14.2	*88.4*	*50.7*		
[a] 25	do	Lake Victoria	do	20	12.9	13.1	*64.5*	*79.9*	15.33	[3] 13	7.4	13.8	*94.2*	*53.6*	11.1	10.6
792	A. L. S.	Tamworth	do	20.4	13.2	13.5	*64.7*	*80.4*	15.70							10.7
23316	N. M. M.	Lower Darling	do	19.6	12.7	13.4	*64.8*	*82.7*	15.23	[3] 11.5	[5] 7.4	13.6	*84.6*	*54.4*	11.7	10.9
[b] 17748	do	Euston	do	18.5	12.2	13.6	*66*	*88.3*	14.77	[4] 11.3	6.4	[5] 13	*86.9*	*49.2*	10.9	10.4
[d] 219	S. A. M. A.	Darling River	do	19.1	12.6		*66*			[10] 9.6	6.3	[5] 13	*73.8*	*48.5*		
S1158	A. M. S.	Yabtree, Gundagai	do	19	12.6	13.8	*66.3*	*87.3*	15.13							10
11348	do		do	19.6	13		*66.3*									
31	A. L. M.		do	19.6	13.1	14.2	*66.8*	*86.6*	15.63	[4] 12	7	13.9	*86.3*	*50.4*	9.6	10.3
1469	A. M. S.	Port Stephan	do	19	12.7	13.3	*66.8*	*84.2*	15		[5, 6] 7.2				[5] 10.8	10.2
34	A. L. A.	Moorna	do	19.8	13.3	12.8	*67.2*	*77.1*	15.30	[3] 12.5	[5, 6] 7.6	13.7	*91.2*	*55.5*	11.5	10.5
28922	N. M. M.		do	19.3	13	13	*67.4*	*80.2*	15.10		7.2				11	10.8
E16372	A. M. S.	Darling River	do	19.4	13.1	13.1	*67.5*	*80.9*	15.20	[4] 12.7	(e)	12.9	*98.4*			10.7
1308	A. L. S.	Sidney	do	20.1	13.6	14.4	*67.7*	*85.7*	16.03	[3] 11.3	7	[5] 13.5	*83.7*	*51.8*	11.3	11.1
S267	A. M. S.	Grafton	do	19.6	13.3	14.1	*67.9*	*88*	15.67	[4] 12.5	7.6	13.7	*91.2*	*55.5*	11.3	10.5
430	S. A. M. A.	Lake Victoria	do	18.8	12.8	13.3	*68.1*	*84.2*	14.97	([illegible])	[5, 6] 6.5	13.4		*48.5*	9.9	10.4
S1643	A. M. S.	Cronella	do	18.8	12.8	(f)	*68.1*				7.1					
[e] 1210	do		do	20.2	13.8	[5] 14.1	*68.3*	*82.9*	16.03		[5] 7.3				[5] 11	[5] 10.9
[e] S1650	do	Bogan	do	18.4	12.6	12.4	*68.5*	*80*	14.47		[5] 6.4	13.3		*48.1*	10.4	9.6
A11773	do	Cobar	do	18.6	12.8	13.4	*68.8*	*85.4*	14.93	[9] 11.7	7.2	[5] 12.4	*94.4*	*58.1*	9.8	9.6
113	S. A. M. A.	Rufus Creek	do	19	13.1	13.2	*69*	*82.5*	15.10		7.1	13.5		*52.6*	10.9	10.3
E13308	A. M. S.	Darling River	do	18.8	13	13	*69.2*	*81.8*	14.93		6.8	13.2		*51.5*	11	9.9
23	A. L. A.	Rufus Creek	do	18.9	13.1	13	*69.3*	*81.2*	15	[10] 11	[5, 6] 7	14	*78.6*	*50*	[5] 10.3	10
[h] 38	S. A. M. A.	Tolarno	do	18.9	13.2	13.4	*69.4*	*83.8*	15.17	11.3	6.7	14	*80.7*	*47.9*	11.2	10.4
13424	N. M. M.	Deniliquin	do	19.6	13.6	13.4	*69.4*	*80.7*	15.53							10.2
18	A. L. M.		do	19.7	13.7	14.1	*69.5*	*84.4*	15.83		7.8	14		*52.1*	10.4	9.7
S637	A. M. S.	Richmond River	do	19.1	13.3	13.1	*69.6*	*80.9*	15.17	[4] 10.7	6.5	12.6	*84.9*	*51.6*	10.4	10.4
21	A. L. M.		do	19.8	13.8	13.4	*69.7*	*79.8*	15.67		[5] 6.9					11
A46	A. M. S.	Cowra	do	19.5	13.6	13.9	*69.7*	*83.7*	15.67	[9] 10.5	[5, 8] 7.3	13.4	*78.4*	*54.5*	10.4	10.2
[i] 24	S. A. M. A.	Lake Victoria	do	18.6	13	13.4	*69.9*	*84.8*	15	[3] 11.6	6.8	13.5	*85.9*	*60.4*	11.3	10.2
2356	A. L. S.	Near Sidney	do	18.6	13	13.2	*69.9*	*83.5*	14.93	[3] 11.8	[5, 6] 7.2	13.3	*88.7*	*54.1*	10.8	10.2
16906	N. M. M.	Deniliquin	do	19	13.3	13	*70*	*80.2*	15.10		[6] 7.3				10.7	10.3
[j] 36	A. L. A.	Moorna	do	18.4	12.9	12.9	*70.1*	*82.7*	14.73	[10] 10.8	6.5	13.3	*81.2*	*48.9*	11.1	10.4
12	A. L. M.		do	19.8	13.9	14.2	*70.2*	*84.5*	15.97		7				10.7	10.5
10	do		do	18.2	12.8	13.5	*70.3*	*87.1*	14.83		(g)	13.2				10.2

117	S. A. M. A	Moorna	do	18.7	13.2	13.8	*70.6*	*86.2*	15.23	[11] 11.9	7	13.9	*85.6*	*50.4*	10.7	10.7
118	do		do	18.7	13.2	12.3	*70.6*	*76.9*	14.73	[9] 11	6.8	12	*91.7*	*56.7*	10.7	9.5
794	A. L. S	Near Sidney	do	18.4	13	13	*70.6*	*82.8*	14.80		6.7	13.4		*50*	10.4	9.5
[e] A11969	A. M. S	Wellington Caves	do	18	12.8	12.8	*71.1*	*83.1*	14.53	[9] 11	6.8	13.1	*84*	*51.9*	9.7	9.6
[k] 477	A. L. S	Kyogle	do	19.4	13.9	13.4	*71.6*	*80.7*	15.57	[4] 11.8	6.6	[1] 14.2	*83.1*	*46.5*	10.5	10
706a	do	Nowoa	do	18.7	13.4	13.8	*71.7*	*86.2*	15.30	[2] 11.1	7.5	14.4	*77.1*	*52.1*	10.6	10.4
26	A. L. M		do	19.2	13.8	14.2	*71.9*	*86.1*	15.73							10.5
23	do		do	18.6	13.4	13.6	*72*	*85*	15.20		6.7	13.8		*49.6*	10.6	10.3
1288	A. M. S	Manning	do	18.6	13.4	13.6	*72*	*85*	15.20		6.2	13		*47.7*	9.8	10.1
132	S. A. M. A	Kinchega	do	[1] 17.9	12.9		*72.1*				7.1	13.3		*53.4*		
12862	N. M. M	Riverina	do	19	13.7	13.8	*72.1*	*84.2*	15.50	[4] 10.9	7	13.8	*79*	*50.7*	10.2	10.2
S1611	A. M. S	Newcastle	do	18.3	13.2	12.9	*72.1*	*81.6*	14.80		= 7.2	13.6		*52.9*	10.7	10.5
• S1609	do	do	do	19	13.7	13.8	*72.1*	*84.2*	15.50	[2] 12	(13)	13.6	*88.2*			10.7
2355	A. L. S	Near Sidney	do	18.8	13.6		*72.3*			[7] 11.5	[3,6] 6.8	13.2	*87.1*	*51.5*		
S744	A. M. S	Merimbula	do	18.6	13.5	13.4	*72.6*	*83.8*	15.17		6.5	13.3		*48.9*	9.6	10.1
798	A. L. S	Bondi	do	18.9	13.8	13.6	*73*	*82.9*	15.43		[3,6] 6.6				[5] 10.3	10.4
37	S. A. M. A	Silverton	do	18.6	13.6	13	*73.1*	*80.8*	15.07	[4] 10.8	6.7	13.2	*81.8*	*50.8*	10.1	10.1
28019	N. M. M		do	18.2	13.4	13.2	*73.6*	*83.5*	14.93	[2] 11.4	7.5	13.5	*84.4*	*55.6*	10.1	10.8
S1610	A. M. S	Newcastle	do	18.6	13.7	14.7	*73.7*	*90.7*	15.67	[4] 11.7	[33] 7	13.8	*84.8*	*50.7*	10.6	10.5
795	A. L. S		do	19	14	13.6	*73.7*	*82.4*	15.53		6.6	13.5		*48.9*	10.4	10.3
1180	A. M. S	Shoalhaven	do	18.9	14	14	*74.1*	*85.4*	15.63		7.5				10.3	10.6
620	A. L. S	Port Jackson	do	18.6	13.9	13.4	*74.7*	*82.7*	15.30		(13)					10.2
616	do	Near Sidney	do	18.8	14.1	13.8	*75*	*84.2*	15.57		[6] 7.3				[5] 10.6	10.1
[e] 690	do	Port Jackson	do	17.6	13.5	13.4	*76.7*	*85.9*	14.83		7.3				10.1	9.9
				(59)	(59)	(53)	(40)	(53)	(53)	(73)	(50)	(42)	(78)	(36)	(44)	(53)
Totals				1,121.1	783.2	713.3				832.6	348.6	565			465.5	545.6
Averages				*19*	*13.27*	*13.46*	*69.9*	*83.4*	*15.25*	*11.47*	*6.97*	*13.45*	*85.2*	*51.4*	*10.58*	*10.29*
Minima				17.6	12.2	12.3	*64.5*	*76.9*	14.47	9.6	6.2	12	*73.8*	*46.5*	9.6	9.5
Maxima				20.4	14.1	14.7	*76.7*	*90.7*	16.03	13	7.6	14.4	*98.4*	*58.1*	11.7	11.1

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 29.

NEW SOUTH WALES CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
					°	°										
433	S. A. M. A.	Moorna	Adult				3.65				4.65	3.15	*67.7*			
25	do	Lake Victoria	do	9.6	61.5	49	4.4	3.22	4.25	*75.8*	5	3.05	*61*	6.6	7.5	*113.6*
792	A. L. S.	Tamworth	do	9.2				3.52	3.95	*89.1*	5.2	2.6	*50*			
23316	N. M. M.	Lower Darling	do	10.2	65	50	3.3	3.4	4.12	*82.5*	4.9	2.95	*60.2*	6.8	7.2	*105.9*
17748	do	Euston	do	9.9	68.5	53	3.5	2.9	4	*72.5*	4.6	2.75	*59.8*	6.5	6.8	*104.6*
219	S. A. M. A.	Darling River	do				3.05	3.32	3.9	*85.1*	4.45	2.75	*61.7*	6.4	6.8	*106.2*
S1158	A. M. S.	Yabtree, Gundagai	do													
11348	do		do													
31	A. L. M.		do	8.5	75	56.5	4	[20] 3.2	[20] 3.85	*83.1*	4.8	3.05	*63.5*	6	7.3	*121.7*
1469	A. M. S.	Port Stephan	do	9.5	66	55.5		[20] 3.25	[20] 3.9	*83.3*	4.55	2.7	*59.4*	6.5	7.2	*110.8*
34	A. L. A.	Moorna	do	9.8	63	45	4.05	3.55	4.15	*85.5*	5.15	2.65	*51.4*	7	7.1	*101.4*
28922	N. M. M.		do	9.5	69	48		[19] 3.1	[19] 3.7	*83.3*	4.95	.7	*54.6*	6.3	7.1	*112.7*
E16372	A. M. S.	Darling River	do	9.4			3.8	3.45	3.95	*87.3*	[18] 5.2	2.65	*51*			
1308	A. L. S.	Sidney	do	9.8	70	43.5	3.6	3.12	3.85	*81*	5.1	2.85	*55.9*	6.7	7.1	*106*
S267	A. M. S.	Grafton	do	9.8	64	46	3.65	3.78	4.1	*92.2*	5.35	3.2	*59.8*	6.4	7.1	*110.9*
430	S. A. M. A.	Lake Victoria	do	8.8	75.5	48	3	[20] 3.8	[20] 3.9	*97.4*	4.9	2.8	*57.1*			
S1643	A. M. S.	Cronella	do					[20] 3.25	[20] 3.6	*90.3*	4.55	2.4	*58.8*			
1210	do		do	9.8	70	49.5		[20] 3.6	[20] 4	*90*	5.4	2.95	*54.6*	6.6	7.3	*110.6*
S1650	do	Bogan	do	9.2	65	50.5		3.12	3.8	*82.1*	4.4	2.9	*65.9*	6	6.6	*110*
A11773	do	Cobar	do	8.4	67	48	3.55	3.6	3.75	*96*	5.05	2.6	*51.5*	5.9	6.6	*111.9*
113	S. A. M. A.	Rufus Creek	do	9.4	66	45		3.45	3.95	*87.3*	5	3.05	*61*	6.4	7	*109.4*
E13308	A. M. S.	Darling River	do	9.6	62.5	47		3.15	3.8	*82.9*	[18] 4.6	2.6	*56.5*	6.4	6.9	*107.8*
23	A. L. A.	Rufus Creek	do	9	67.5	48.5	3.5	3.2	3.85	*83.1*	5	2.65	*53*	6	7	*116.7*
38	S. A. M. A.	Tolarno	do	9.9	65.5	51		3.15	3.95	*79.7*	4.45	2.6	*58.4*	6.4	6.6	*103.1*
13424	N. M. M.	Deniliquin	do													
18	A. L. M.		do	8.7	63.5	41.5		3.58	3.85	*93*	5.05	3.15	*62.4*	6.7	7.4	*110.4*
S637	A. M. S.	Richmond River	do	9.3	72	48	2.95	3.5	3.82	*91.6*	4.9	3.2	*65.3*	5.9	6.6	*111.9*
21	A. L. M.		do	10.1			3.4	2.95	3.6	*81.9*	4.75	2.85	*60*			
A46	A. M. S.	Cowra	do	9.2	68	56	3.8	3.1	4.02	*77.1*	4.75	2.8	*59*	6.2	7.5	*121*
24	S. A. M. A.	Lake Victoria	do	9.8	63	47	3.7	3.18	3.85	*82.6*	4.5	2.6	*57.8*	6.6	6.7	*101.5*
2356	A. L. S.	Near Sidney	do	9.6	65.5	54	3.6	3.28	3.68	*89.1*	4.9	2.5	*51*	6.6	6.6	*100*
16996	N. M. M.	Deniliquin	do	9.3	67	49		[19] 3.2	[19] 4	*80*	5.1	2.9	*56.9*			
36	A. L. A.	Moorna	do	9.8	67	48.5	3.6	3.25	3.88	*83.8*	4.5	3.1	*68.9*	6.6	6.6	*100*

12	A. L. M		do	9.6	69	53		3.52	3.75	*93.9*	5.1	2.8	*54.9*	[i] 6.3	6.5	*103.2*
10	do		do	9				3.6	3.9	*92.3*	5.05	2.75	*54.4*			
117	S. A. M. A	Moorna	do	9.6	71	52		3.72	3.85	*96.6*	5.2	2.8	*53.8*	6.3	7	*111.1*
118	do		do	8.2	61	27		3.28	3.98	*82.4*	4.6	2.8	*60.9*	5.6	6.4	*114.3*
794	A. L. S	Near Sidney	do	9	63	42		3.05	3.8	*80.3*	4.85	2.8	*57.7*	6.2	6.6	*106.4*
A11969	A. M. S	Wellington caves	do	8.8	68.5	57	3.1	3.32	3.85	*86.2*	4.9	3	*61.2*	6	7.2	*120*
[k] 477	A. L. S	Kyogle	do	9.3	67.5	53	3.8	3.3	4	*82.5*	4.4	2.6	*59.1*	6.1	7.1	*116.4*
706a	do	Nowoa	do	9.3	68	50	3.5	2.9	4.25	*68.2*	5.4	3.05	*56.5*	5.9	7.2	*122*
26	A. L. M		do	9.6				2.92	3.8	*76.8*	4.3	2.95	*68.6*			
23	do		do	9.4	69	50		3.18	4	*79.5*	4.8	2.75	*57.3*	6.3	6.9	*109.5*
1238	A. M. S	Manning	do	8.9	74.5	57		3.28	3.8	*86.3*	4.5	2.6	*57.8*	5.6	6.6	*117.9*
• 132	S. A. M. A	Kinchega	do					3.52	4	*88*	5	2.55	*51*	6.2	6.6	*106.4*
12862	N. M. M	Riverina	do	9.2	70	55	3	3.12	3.75	*83.2*	[18] 5.15	2.7	*52.4*	[m] 5.9	7.1	*120.3*
S1611	A. M. S	Newcastle	do	9.4	69	52		3.32	3.9	*85.1*	[18] 4.95	2.75	*55.6*	6	7.2	*120*
S1609	do	do	do	9.4			[j] 3.5	3.52	3.75	*93.9*	5	2.8	*56*			
2355	A. L. S	Near Sidney	do				3.4	3.5	3.98	*87.9*	[18] 4.9	2.7	*55.1*	[i] 6	6.8	*113.3*
S744	A. M. S	Merimbula	do	8.6	75	58		3.2	3.8	*84.2*	4.4	2.6	*59.1*	5.9	6.6	*111.9*
798	A. L. S	Bondi	do	9.5	72.5	60		[20] 3.4	[20] 3.8	*89.5*	4.8	2.75	*57.3*	6	6.6	*110*
37	S. A. M. A	Silverton	do	9	70.5	51.5		3.05	3.9	*78.2*	4.9	2.9	*59.2*	6.1	7	*114.8*
28919	N. M. M		do	8.9	70	50.5	3.4	3.52	3.85	*91.4*	[o] 5.5	2.85	*51.8*	5.8	6.5	*112.1*
S1610	A. M. S	Newcastle	do	9.4	70	53	3.4	3.25	3.95	*82.3*	[o] 4.8	2.9	*60.4*	6.2	6.8	*109.7*
795	A. L. S		do	9.4	70.5	50		3.4	3.95	*86.2*	5	3	*60*			
1180	A. M. S	Shoalhaven	do	9	71.5	50.5		3.48	3.9	*89.2*	5.45	2.8	*51.4*	5.7	7.4	*129.8*
620	A. L. S	Port Jackson	do	9.2				3.5	4.05	*86.4*	4.9	2.5	*51*			
616	do	Near Sidney	do	9.2	66	47		3.38	4.05	*83.4*	5.2	2.7	*51.9*	6.3	6.8	*107.9*
[a] 609	do	Port Jackson	do	9	67	50		3.4	3.65	*93.2*	[p] 5.15	2.4	*46.6*	6.1	6.8	*111.5*
Totals				(51) 475	(44)	(44)	(27) 95.2	(55) 182.8	(55) 214.28	(55)	(56) 273.9	(56) 156.5	(56)	(44) 274	(44) 304.3	(44)
Averages				*9.31*	*68*	*50*	*3.53*	*3.32*	*3.9*	*85.1*	*4.89*	*2.79*	*57.1*	*6.23*	*6.92*	*111.1*
Minima				8.2	61	27	2.95	2.9	3.6	*68.2*	4.3	2.4	*46.6*	5.6	6.4	*100*
Maxima				10.2	75.5	60	4.4	3.8	4.25	*97.4*	5.5	3.2	*68.9*	7	7.5	*129.8*

[a] Whole skeleton; very brutish looking.
[b] Both upper median incisors broken.
[c] Surely male.
[d] Looks in full face somewhat femalelike, but is male.
[e] All upper incisors missing.
[f] High.
[g] Camonerdy tribe.
[h] Massive.
[i] Whole skeleton; small male.
[j] Looks somewhat malelike, but not characteristic.
[k] No. 43 in catalogue of Eger, Weimar, 1911.
[l] Zygomae tremendously developed.
[m] Right upper median incisor missing; both lower median incisors missing.
[n] Upper arch square in front, lower less.
[o] Medium intranasal shelves.
[p] Marked intranasal shelves.

NOTE.—For footnotes to reference figures see p. 3.

QUEENSLAND CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
[a] 15224	A. M. S.	Mapoon	Adult	18.4	11.8	13.2	*64.1*	*87.4*	14.47	[4] 12	[5] 7.4	13.1	*91.6*	*56.5*	10.8	10.4
15242	do	Bathurst Head	do	19.2	[5] 12.5	14.1	*65.1*	*89.2*	15.27	[9] 11.2	6.8	13.6	*88.4*	*50*	10.9	10.6
15212	do	McIvor River	do	18.7	12.3	14	*65.8*	*90.3*	15	11.2		12.8	*87.5*			10.6
10390	do		do	19.9	13.2	14.1	*66.3*	*84.9*	15.73							10.8
15178	do	Rockhampton	do	19	12.6	13.8	*66.3*	*87.3*	15.13	[9] 12.1	7.4	13.6	*89*	*54.4*	11.1	10.4
15222	do	Mapoon	do	18.9	12.6	13	*66.7*	*82.3*	14.83	[10] 10.6	[5, 6] 7.2	13.7	*77.4*	*52.6*	9.5	10.2
[b] 15214	do	Rockhampton	do	18	12	13.2	*66.7*	*88*	14.40	[7] 11	6.4	13.2	*83.3*	*48.5*	10.1	9.8
15192	do	Mirriam Vale	do	19.8	13.2	13.6	*66.7*	*82.4*	15.53		7.2	13.4		*53.7*	10.1	10.4
15173	do	North Keppel Island	do	19.6	13.1	13.2	*66.8*	*80.5*	15.30		7	14.1		*49.6*	10.8	10.3
15174	do	do	do	19	12.8	13.6	*67.4*	*85.5*	15.13		7.1	[8] 13.7		*51.8*	10.8	10.2
15237	do	Carandotta	do	18.9	12.8	13.4	*67.7*	*84.8*	15.03	[4] 10.6	6.6	13.4	*79.1*	*49.2*	10.7	9.8
15159	do	Brisbane	do	19.4	13.2	14.4	*68*	*88.3*	15.67	[9] 11.8	6.9	14.4	*81.9*	*47.9*	10.7	10.6
15190	do	South Keppel Island	do	18.8	12.8	13.2	*68.1*	*85.5*	14.93		6.6	13.3		*49.6*	10.5	9.8
10510	do	Tinaroo Cairns	do	19.1	13	13.8	*68.1*	*86.2*	15.30	[7] 10.9	6.5	14.5	*75.2*	*44.8*	10.1	9.8
15223	do		do	19	13	13.8	*68.4*	*86.2*	15.27	[9] 12.3	7.5	13.2	*93.2*	*56.8*	10.1	10.3
15170	do	North Keppel Island	do	18.8	12.9	13	*68.6*	*82.3*	14.90	[10] 10.8	6.9	13.1	*82.4*	*52.7*	10.9	10.3
[c] 15216	do	Cloncurry	do	18.8	12.9	13.6	*68.6*	*86.1*	15.10	[4] 11.5	(18)	13	*88.5*			9.8
13	A. L. M.		do	18.6	12.8	13.3	*68.8*	*84.7*	14.90		(5)					10.5
15168	A. M. S.	North Keppel Island	do	18.7	12.9	13.2	*69*	*85.5*	14.93	[10] 10.5	7	13	*80.8*	*53.8*	11	10.6
15189	do	South Keppel Island	do	18.7	12.9	13	*69*	*88.3*	14.87		7.1	13.2		*53.8*	10.8	10.0
[d] 15161	do		do	18.2	12.6	13	*69.2*	*84.4*	14.60	[9] 11.1	6.5	12.7	*87.4*	*51.2*	9.9	9.8
8	A. L. M.		do	19.5	13.5	14	*69.2*	*84.8*	15.67							10.4
15163	A. M. S.	Craijnduth	do	19.6	13.6	14	*69.4*	*84.3*	15.73	[3] 12.6	7.6	14.1	*89.4*	*53.9*	10.7	10.6
1145	do	Brisbane	do	18.6	13	13.5	*69.9*	*85.4*	15.03		[5] 7	13.2		*53*	[5] 9.6	9.2
15181	do		do	18.2	12.8	13.4	*70.3*	*88.4*	14.80	[9] 11.3	6.6	12.5	*90.4*	*52.8*	10.4	10.2
1239	do	Brisbane	do	18.6	13.1	13.6	*70.4*	*86.1*	15.10		7				10.5	10.1
15171	do	North Keppel Island	do	19	13.4	13.2	*70.5*	*81.5*	15.20	[3] 11.4	7	13.4	*85.1*	*52.2*	11.1	10.8
15201	do	Yeppoon	do	18.6	13.2	13.4	*71*	*84.3*	15.07		[5] 7.2	14		*51.4*	10.2	10
[e] 10283	do	West Queensland	do	18	12.8	13.6	*71.1*	*88.3*	14.80	[3] 10.6	6.6	13	*81.6*	*50.8*	10.8	9.8
[f] 15218	do	Cairns	do	18.8	13.4	13.7	*71.3*	*85.1*	15.30	10.2	6.1	13.1	*77.9*	*46.6*	10.4	10.2
15165	do	Yaambra	do	18.2	13	13.8	*71.4*	*88.5*	15	[9] 11.3	6.5	13.2	*85.6*	*49.2*	10	10.1
15186	do	Marlborough	do	18.6	13.3	14	*71.5*	*87.5*	15.30							10.9
15221	do	Cardwell	do	19	13.6	14.2	*71.6*	*87.1*	15.60			14.1				10.3

15184	do	Marlborough		18.5	13.3	13.9	71.9	87.4	15.23	[7] 12.8	7.6	13.2	97	57.6	10.4	10.1
1224	do	Rockhampton	do	18.9	13.6	15	72	92.6	15.83		6.4	[16] 14.5		44.1	10.5	10.6
E15156	do	Roxburgh Downs	do	18.2	13.1	12.9	72	82.7	14.73	[3] 11.8	7.8	13.4	88.1	54.5	10.6	9.7
[g] 1252	do	Rockhampton	do	19	13.8	13.2	72.6	80.5	15.33	[9] 11	6.4	14	78.6	45.7	10.9	10.5
16	A. L. M.		do	18.7	13.6	13.9	72.7	85.8	15.40		(9)					10.4
[h] 15177	A. M. S.	North Keppel Island	do	18.7	13.6	13	72.7	80.2	15.10	[3] 10.7	6.4	13.8	77.5	46.4	10.9	10.2
[e] 15239	do	Carrandotta	do	17.4	12.8	13.2	73.6	87.4	14.47	[4] 10.9	6.3	13.4	81.3	47	9.8	9.7
[e] 15234	do	Riversleigh	do	17.3	12.8	12.7	74	84.7	14.27	[9] 12.1	7.2	12.5	96.8	57.6	9.2	10
11	A. L. M.		do	18.4	13.7	14.2	74.5	88.8	15.43		6.1				10.2	10.5
[i] 15183	A. M. S.		do	18.6	13.9	14.4	74.7	88.9	15.63	[9] 12.9	7.6	13.6	94.8	55.9	10.7	11
1231	do	Cape York	do	19	14.2	14.4	74.7	86.8	15.87			13.7				10.5
12562	do	Dawson River	do	17.9	13.4	13.9	74.9	89.1	15.07	[2] 11	(13)					9.6
15199	do	Mount Morgan	do	18.3	13.8	14.2	75.4	88.8	15.43		6.7	13.5		49.6	10.2	10.2
[k] 15185	do	Marlborough	do	(18.2)	(13.8)	(13.6)	(75.8)	(85)	(15.20)		6.7	13.5		49.6	10.6	10
12	A. L. M.		do	17.8	13.6	14	76.4	89.2	15.13		6.9	14		49.5	9.7	10.3
10506	A. M. S.		do	17.8	13.6	13.2	76.4	84.1	14.87	10.9	6.1	13.1	83.8	46.6	9.8	9.8
231	A. L. S.	Coast of Queensland	Just adult	18	13.8	13.4	76.7	84.3	15.07	[9] 10	6.2	13.3	75.2	46.6	10.3	10.1
[26] 15164	A. M. S.	Glenroy	Adult	(17.7)	(13.7)	(14.5)	(77.4)	(92.4)	(15.30)	[7] 11.9	7.3	14.5	82.1	50.3	11	10.6
[j] [26] 15157	do		do	(17.4)	(14.1)	(14.6)	(81)	(92.4)	(15.37)	[9] 11.2	6.6	12.7	88.2	52	10.1	10.1
Totals				(49) 914.7	(49) 643.2	(49) 667.4	(49)	(49)	(49)	(32) 362.2	(42) 287.5	(44) 592.3	[illegible]	[illegible]	(42) 437.4	(52) 531
Averages				*18.67*	*13.13*	*13.62*	*70.3*	*85.7*	*15.14*	*11.32*	*6.84*	*13.46*	*84.8*	*50.9*	*10.41*	*10.21*
Minima				17.3	11.8	12.7	64.1	80.2	14.27	10	6.1	12.5	75.2	44.1	9.2	9.2
Maxima				19.9	14.2	15	76.7	98.6	15.87	12.9	7.6	14.5	97	57.6	11.1	11

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 33.

QUEENSLAND CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal index* $\left(\frac{l}{b\times100}\right)$
					°	°										
[a] 15224	A. M. S.	Mapoon	Adult	9.4	66.5	47.5	3.45	3.6	4.1	*87.8*	[k] 5.3	2.95	*55.7*	6.4	6.9	*107.8*
15242	do	Bathurst Head	do	9.8	69	54.5	3.3	[19] 3.1	[19] 3.85	*80.5*	4.8	2.85	*59.4*			
15212	do	McIvor River	do	9.2			3.45	[19] 3.45	[19] 3.9	*88.5*	5.1	2.6	*51*			
10390	do		do	9.7				3.3	3.75	*88*	4.9	2.75	*56.1*			
15178	do	Rockhampton	do	9.8	65	52	3.8	3.42	4.1	*83.4*	5.1	2.8	*54.9*	6.3	6.5	*103.2*
15222	do	Mapoon	do	8.6	74	57	[1] 3	3.7	3.95	*93.7*	5.4	2.8	*51.8*	5.6	6.6	*117.9*
[b] 15214	do	Rockhampton	do	8.8	69	48	3.3	3.52	3.8	*92.6*	[1] 4.4	2.95	*67*	5.9	6.2	*105.1*
15192	do	Mirriam Vale	do	9	71.5	52.5		3.5	4.02	*87.1*	5.3	2.7	*50.9*	5.9	6.8	*115.2*
15173	do	North Keppel Island	do	9.6	67	52		3.35	3.7	*90.5*	4.85	2.75	*56.7*	6.2	7.1	*114.5*
15174	do	do	do	9.5	66	51		[20] 3.2	[20] 3.9	*82*	[18] 4.85	2.6	*53.6*	6.1	7.1	*116.4*
15237	do	Carandotta	do	8.9	64	33	3.15	3.25	4.05	*80.2*	4.8	3	*62.5*	6.3	6.6	*104.8*
15159	do	Brisbane	do	9.4	70	49	3.3	3.4	3.85	*88.3*	4.9	2.85	*58.2*	6.1	7.3	*119.7*
15190	do	South Keppel Island	do	9.2	65.5	44		3	3.65	*82.2*	4.85	3	*61.9*	6.2	6.8	*109.7*
10510	do	Tinaroo Cairns	do	9	68	52	3.1	3.48	3.7	*94*	4.55	2.75	*60.4*	5.7	7.1	*124.6*
15223	do		do	8.8	70	55.5	3.65	3.25	4.08	*79.6*	4.8	2.6	*54.2*	6	6	*100*
15170	do	North Keppel Island	do	9.7	66.5	50	3	3.48	3.65	*95.3*	5	2.55	*51*	5.8	6.6	*113.8*
[c] 15216	do	Cloncurry	do	8.6			3.3	3.7	3.9	*94.9*	4.55	2.8	*61.5*			
13	A. L. M.		do	9.5				3.25	3.8	*85.5*	3.8	2.85	*75*			
15168	A. M. S.	North Keppel Island	do	9.7	68	50.5	3.2	3.38	3.68	*91.8*	[18] 4.9	2.35	*48*	5.6	6.5	*116.1*
[c] 15189	do	South Keppel Island	do	9.6	64	53.5		3.25	3.7	*87.8*	4.8	2.6	*54.2*	6.2	6.7	*108.1*
[d] 15161	do		do		70		3.2	3.58	3.75	*95.5*	(a)			5.6	6.5	*116.1*
8	A. L. M.		do				3.4	[19] 3.4	[19] 3.9	*87.2*						
15163	A. M. S.	Craijnduth	do	9.4	68.5	55	4.1	3.3	3.75	*88*	5	2.9	*58*	6.3	6.5	*103.2*
1145	do	Brisbane	do	8.2	65	48		3.42	4	*85.6*	[18] 4.75	2.45	*51.6*	5.7	6.6	*115.8*
15181	do		do	9.4	70	52	3.2	[20] 3.4	[20] 3.8	*89.5*	4.95	2.7	*54.6*	5.8	6.8	*117.2*
1239	do	Brisbane	do	9	67	48		[19] 3.35	[19] 4.05	*82.7*	4.65	2.7	*58.1*	6.2	7.4	*119.4*
15171	do	North Keppel Island	do	9.8	69	44	3.3	3.52	3.7	*95.1*	[18] 5.3	2.75	*51.9*	5.8	7	*120.7*
15201	do	Yeppoon	do	8.7	68	46.5		3.35	4	*83.8*	5	2.85	*57*			
[e] 10283	do	West Queensland	do	9.4	63	46.5	[5] 3.5	3	3.65	*82.2*	[19] 4.5	2.3	*51.1*	6.5	7.3	*112.3*
[f] 15218	do	Cairns	do	9.4	71	49	2.7	3.45	3.78	*91.3*	[e] 4.6	2.6	*56.5*	6	6.3	*105*
15165	do	Yaambra	do	9.1	72	56	3.2	3.12	3.9	*80*	4.75	2.85	*60*	5.8	6.4	*110.3*
15186	do	Marlborough	do													

15221	do	Cardwell	do	9.1				3.3	[p] 3.85	85.7	4.95	3.05	61.6			
15184	do	Marlborough	do	9	67	49	3.75	3.58	3.8	*94.2*	5.35	2.65	*49.5*	6.1	6.6	*108.2*
1224	do	Rockhampton	do	9.5	73.5	55		3.25	4	*81.2*	4.6	2.8	*60.9*	6	7.3	*121.7*
E15156	do	Roxburgh Downs	do	9.2	63	50.5	4	3.4	3.8	*89.5*	4.8	2.45	*51*	6.3	7.2	*114.3*
[e] 1252	do	Rockhampton	do	9.9	69	44	3.4	3.2	3.95	*81*	5.1	3.2	*62.8*	6.3	6.9	*109.5*
16	A. L. M.		do	9.8				3.3	3.95	*83.6*	4.75	2.55	*53.7*	[k] 6.2	7.2	*116.1*
[h] 15177	A. M. S.	North Keppel Island	do	9.8	66.5	48.5	3	2.95	3.7	*79.7*	4.7	2.7	*57.4*	5.8	6.7	*115.5*
[m] 15239	do	Carrandotta	do	8.7	70.5	47.5	3.05	[19] 3.2	[19] 4	*80*	4.75	2.6	*54.7*	5.8	6.1	*105.2*
[n] 15234	do	Riversleigh	do	8.2	74.5	55.5	3.5	[19] 3.7	[19] 4	*92.5*	5.25	2.7	*51.4*	5.7	6.5	*114*
11	A. L. M.		do	9	75.5	47		3.22	3.98	*80.9*	4.55	2.7	*59.4*	5.8	6.8	*117.2*
[i] 15183	A. M. S.		do	9.6	72	52.5	3.3	3.52	3.95	*89.1*	5.75	3.1	*53.9*	6.1	7.1	116.4
1231	do	Cape York	do	8.8				3.48	3.8	*91.6*	5.4	3.35	*62*			
12562	do	Dawson River	do	8.6			3.6	2.95	3.8	*77.6*	4.55	2.5	*55*			
15199	do	Mount Morgan	do	8.8	71	46.5		3.25	4	*81.2*	[18] 4.7	2.75	*58.5*	5.8	6.9	*119*
[j] 15185	do	Marlborough	do	9.2	66.5	45.5		2.92	3.95	*73.9*	4.85	2.9	*59.8*	6.3	7.1	*112.7*
12	A. L. M.		do	8.8	75	57		3.58	4.2	*85.2*	5.15	2.65	*51.5*	5.5	6.7	*121.8*
10506	A. M. S.		do	8.9	72	56.5	3.5	3.45	3.7	*93.2*	4.3	2.7	*62.8*	5.7	6.3	*110.5*
231	A. L. S.	Coast of Queensland	Just adult	9	70.5	45	2.95	3.3	3.8	*86.8*	[18] 4.5	2.65	*58.9*	5.8	6.95	*119.8*
[m] 15164	A. M. S.	Glenroy	Adult	9.6	67.5	49	3.8	3.35	3.92	*85.4*	5.1	2.9	*56.9*	6.6	7.2	*109.1*
[m] 15157	do		do	9.1	71	56	3.3	3.32	3.8	*87.4*	4.65	2.45	*52.7*	6	6.8	*113.3*
Totals				(49) 450.8	(41)	(41)	(33) 110.75	(51) 170.60	(51) 197.36	(51)	(49) 238.2	(49) 134.55	(49)	(41) 245.8	(41) 277.95	(41)
Averages				*9.2*	*69*	*50*	*3.36*	*3.35*	*3.87*	*86.6*	*4.86*	*2.75*	*56.6*	*6*	*6.78*	*113*
Minima				8.2	63	33	2.7	2.92	3.65	*73.9*	3.8	2.3	*48*	5.5	6	*100*
Maxima				9.9	75.5	57	4.1	3.7	4.2	*95.5*	5.75	3.35	*75*	6.6	7.4	*124.6*

[a] Surely male.
[b] Pronounced medio-frontal ridge; whole skull low in type; surely male.
[c] Nose looks full-blood, but type differs from the usual; glabella and ridges as in other races, not as typical among Australians.
[d] Yerrandali tribe. Surely male.
[e] Neanderthaloid front; great palate, appears about largest ever seen in man (in breadth). Lower jaw in position a trace of slope backwards—only trace of chin prominence. Lower right molars=3.6 (or 3.7); first missing (estimated); fourth molars, upper, both sides, good size, impacted. True palate is very spacious.
[f] Lower jaw low, but fairly strong; positively male.
[g] Alveolus for right upper median incisors is double (slightly hour-glass shaped); a supernumerary (smaller than any molar) externally between first and second left upper molars and a similar one behind right upper third molar.
[h] Somewhat female-like, but zygomae and molars are large; mastoids decidedly male-like; palate and base male.
[i] Died in Normanton Hospital.
[j] Kunggari tribe.
[k] Medium intranasal shelves.
[l] Weakest lower jaw ever seen in male (no doubt about sex); alveolar process of lower jaw largely absorbed but fairly preserved in front; appears perfect fit with skull.
[m] Exostosis of left subnasal border.
[n] Subnasal fossae.
[o] Asymmetrical.
[p] Inter-dacryon breadth=3.1.

NOTE.—For footnotes to reference figures see p. 3.

WEST AUSTRALIAN CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
54	S. A. M. A.	Eucla	Adult	18.5	12.2	13	*66*	*84.4*	14.57	-------	6.6	13.6	-------	*48.5*	10.4	9.7
57	do.		do.	18.7	12.4	13.1	*66.3*	*84*	14.73	[4] 11.6	7.3	13.3	*87.2*	*54.9*	10.9	10.1
4	do.	Cygnet Bay	do.	18.5	12.8	13.2	*69.2*	*84.6*	14.83	[4] 10.4	-------	13.3	*78.2*	-------	-------	10.4
166	do.	Eucla	do.	19.4	13.5	13.2	*69.6*	*80.5*	15.37	[4] 11.6	7.2	13.8	*84.1*	*52.2*	10.7	10.2
	Dr. Basedow's	North Kimberley	do.	18.7	13.5	12	*72.2*	*74.5*	14.73	-------	[8]	13.6	-------	-------	-------	10
2	A. L. M.		do.	19.4	14.2	13.8	*73.1*	*82.1*	15.80	-------	-------	-------	-------	-------	-------	11
2	do.		do.	18.2	13.3	13.6	*73.2*	*86.1*	15.03	[9] 12	7.7	13.1	*91.6*	*58.8*	10.1	10
1	S. A. M. A.	Cygnet Bay	do.	17.7	13.1	12.6	*74*	*81.8*	14.47	11.7	[5] [13] 6.8	12.8	*91.4*	*53.1*	[5] 10	9.2
4	A. L. M.		do.	18.8	14	13.6	*74.5*	*82.9*	15.47	-------	6.9	14.4	-------	*47.9*	10.6	10.8
[6] 3	do.		do.	18.1	13.5	13.8	*74.6*	*87.3*	15.13	-------	7.3	14.2	-------	51.4	11	10.7
Totals				(10) 186	(10) 132.5	(10) 131.9	(10) -------	(10) -------	(10) -------	(5) 57.3	(7) 49.8	(9) 122.1	(8) -------	(7) -------	(7) 73.7	(10) 102.1
Averages				*18.6*	*13.25*	*13.19*	71.2	82.8	*15.01*	*11.46*	*7.11*	*13.57*	*86.4*	*52.3*	*10.53*	*10.21*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion Subnasal Pt	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth, maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°										
54	S. A. M. A.	Eucla	Adult	9.1	65	50		3.25	4.15	*78.3*	4.4	2.6	*59.1*	5.9	6.5	*110.2*
57	do		do	9.7	64	56		3.15	3.95	*79.7*	4.7	2.6	*55.3*	6	6.2	*103.3*
4	do	Cygnet Bay	do	9				3.3	3.95	*83.6*	4.6	2.5	*54.4*	([b])		
166	do	Eucla	do	9	66	43	3.5	3.5	4.05	*86.4*	[18] 5	2.75	*55*	6.1	6.7	*109.8*
	Dr. Basedow's	North Kimberley	do	8.8				3.45	4.1	*84.2*	5	2.7	*54*			
2	A. L. M.		do	10				3.62	3.95	*91.6*	[c] 5.4	2.85	*52.8*			
2	do		do	8.8	67	53	3.6	3.45	3.98	*86.7*	5.15	2.6	*50.5*	6	6.8	*115.3*
1	S. A. M. A.	Cygnet Bay	do	8.3	63	37.5		3.88	3.75	*103.5*	4.85	2.55	*52.6*	5.9	6.3	*106.8*
4	A. L. M.		do	9.6	73	54.5		3.32	3.95	*84*	5.05	2.7	*53.5*	5.7	[b] 6.4	*112.3*
[a] 3	do		do	10	68	54		3.58	4.05	*88.4*	5.45	3	*55*	5.6	6.7	*119.6*
				(10)	(7)	(7)	(2)	(10)	(10)	(10)	(10)	(10)	(10)	(7)	(7)	(7)
Totals				92.3			7.1	34.5	39.88		49.6	26.85		41.2	45.6	
Averages				*9.23*	*66.5*	*50*	*3.55*	*3.45*	*3.99*	*86.5*	*4.96*	*2.68*	*54*	*5.89*	*6.51*	*110.5*

[a] Atypical.

[b] Upper incisors broken out.

[c] Moderate intranasal shelves.

NOTE.—For footnotes to reference figures see p. 3.

NORTHWEST AUSTRALIAN CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
424	S. A. M. A.		Adult	18.1	11.8	12.8	*65.2*	*85.3*	14.23		6.7	13.3		*50.4*	10.4	10.4
222	do		do	19.6	12.8	13.4	*65.3*	*82.7*	15.27		7.2	12.7		*56.7*	10.8	10.3
423	do		do	19.1	12.6	13	*66*	*82.3*	14.90	[2] 11	6.6	13.4	*82.1*	*49.2*		10.6
18	A. L. A.	Derby	do	19	13.2	13.9	*69.5*	*86.3*	15.37	[4] 13.2	[5] 8.3	13.3	*99.2*	*62.4*	10.5	10.3
1	do	do	do	18.8	13.4	13.6	*71.3*	*84.5*	15.27		([18])	13.8				10.4
	Dr. Basedow's	Forest River	do	19.6	14.1	13	*71.9*	*77.4*	15.57		([25])	13.7				10.1
[5] 18	A. L. A.	Derby	do	17.7	12.8	13.2	*72.3*	*86.8*	14.57		([13])	14.1				9.7
Totals				(7) 131.9	(7) 90.7	(7) 92.9	(7)	(7)	(7)	(2) 24.2	(4) 28.8	(7) 94.3	(2)	(4)	(3) 31.7	(7) 71.8
Averages				*18.84*	*12.96*	*13.27*	*68.8*	*83.5*	*15.02*	*12.1*	*7.2*	*13.47*	*90.6*	*54.6*	*10.57*	*10.26*

Catalogue No. [a]	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle °	Alv. Angle °	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b\times100}\right)$
424	S. A. M. A.		Adult	9.2	71	48		[20] 3.25	[20] 4	*81.2*	[18] 4.95	2.95	*59.6*	6	7	*116.7*
222	do.		do.	9.5	66.5	50		3.42	4	*85.5*	5.05	2.6	*51.5*	6.4	7.1	*110.9*
423	do.		do.	9.2			[5] 3.1	3.22	3.98	*80.9*	4.85	2.9	*59.8*			
18	A. L. A.	Derby	do.	8.9	65	50.5	4.4	3.72	4.15	*89.6*	5.45	3	*55*	6.2	[c] 7.6	*122.6*
1	do.	do.	do.	9.8				3.28	3.95	*83*	[18] 4.9	2.8	*57.1*			
	Dr. Basedow's	Forest River	do.	9.1				[19] 3.2	[19] 3.9	*82*	4.8	2.8	*58.3*			
[b] 18	A. L. A.	Derby	do.	8.6			3.3	3.22	3.82	*84.3*	5.05	2.7	*53.5*			
Totals				(7) 64.3	(3)	(2)	(3) 10.8	(7) 23.31	(7) 27.8	(7)	(7) 35.05	(7) 19.75	(7)	(3) 18.6	(3) 21.7	(3)
Averages				*9.19*	*67.5*	*49.5*	*3.6*	*3.33*	*3.97*	*83.9*	*5.01*	*2.82*	*56.3*	*6.2*	*7.23*	*116.6*

[a] Lower right median incisor and both upper median incisors missing.
[b] Surely male.
[c] Alveolar arches very stout in region of molars.

NOTE.—For footnotes to reference figures see p. 3.

CENTRAL AUSTRALIAN CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
* U	S. A. M. A.		Adult	19.2	13.3	14	69.3	86.4	15.50	[12] 12.1	[8,10] 7.1	13.6	89	52.3	10.5	10.3
B3	do.		do.	19	13.2	13.8	69.5	85.7	15.33		[5,6] 6.5	13.2		49.2	10.5	10.3
797	A. L. S.		do.	19	13.5	13	71	80.2	15.17		(13)					10
	Dr. Basedow's	Flinder's Ranges	do.	18.7	13.3	12.4	71.1	77.5	14.80	[4] 11.3	7	13.5	83.7	51.8	10.7	9.5
"C5"	Dr. Campbell's		do.	19	13.8	13	72.6	79.3	15.27	[3] 10.9	6.7	14.5	75.2	46.2	11.5	11
	Dr. Basedow's	Musgrave Ranges	do.	18.5	14	12.3	75.7	75.9	14.93	[3] 11.3	7	13.3	85	52.6	9.6	10
				(6)	(6)	(6)	(6)	(6)	(6)	(4)	(5)	(5)	(4)	(5)	(5)	(6)
Totals				113.4	81.1	78.5				45.6	34.3	68.1			52.8	61.1
Averages				18.9	13.52	13.08	71.5	80.7	15.17	11.4	6.86	13.62	83.1	50.4	10.56	10.18

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°										
* U	S. A. M. A.		Adult	9.3	68.5	54.5	4.1	3.62	4	90.5	4.75	2.8	59	6.1	6.1	100
B3	do.		do.	9.4	70	54	3.4	3.58	4.12	86.9	[13] 4.45	2.7	60.7	6.1	6.2	101.6
797	A. L. S.		do.					3.12	3.85	81	4.3	2.7	62.8			
	Dr. Basedow's	Flinder's Ranges	do.	9	61	44	3.8	2.78	3.75	74.1	4.55	2.7	59.4	6.4	6.8	106.2
"C5"	Dr. Campbell's		do.	10	69	45.5	3.6	3.3	4.1	80.5	4.65	2.6	55.9	6.6	6.8	103
	Dr. Basedow's	Musgrave Ranges	do.	8.8	72	59.5	3.5	3.45	3.62	95.3	5.2	2.5	48.1	5.7	6.4	112.3
				(5)	(5)	(5)	(5)	(6)	(6)	(6)	(6)	(6)	(6)	(5)	(5)	(5)
Totals				46.5			18.4	19.85	23.44		27.9	16		30.9	32.3	
Averages				9.3	68	51	3.68	3.31	3.91	84.6	4.65	2.67	57.4	6.18	6.46	104.5

* Whole skeleton; Arunta tribe.

NOTE.—For footnotes to reference figures see p. 3.

AUSTRALIAN CRANIA. LOCALITY UNKNOWN

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
12983	N. M. M.		Adult	19.7	12.4	14.2	*62.9*	*88.8*	15.43		7.2	13.3		*54.1*	10.5	10.4
52	S. A. M. A.		do	18.6	12.3	12.8	*66.1*	*83.1*	14.57	11.5	6.7	12.1	*95*	*55.4*	10.6	9.9
51	do		do	19.4	12.9	13.1	*66.5*	*80.9*	15.13		7.6	13		*58.5*	12.3	10.9
12989	N. M. M.		do	19.5	13.7	13.8	*70.3*	*83.1*	15.67	[7] 11.8	7.4	[5] 13.7	*86.1*	*54*	10.8	10.5
12985	do		do	19.2	13.6	14.4	*70.8*	*87.8*	15.73		6.8	13.1		*51.9*	9.9	10.4
12897	do		do	18.2	13	13	*71.4*	*83.3*	14.73		6.6	14.1		*46.8*	10.4	9.8
[1]A132	S. A. M. A.		do	18.8	14	13.1	*74.5*	*79.9*	15.30	[4] 11.2	6.8	13.5	*83*	*50.4*	10.4	9.9
Totals				(7) 133.4	(7) 91.9	(7) 94.4	(7)	(7)	(7)	(3) 34.5	(7) 49.1	(7) 92.8	(3)	(7)	(7) 74.9	(7) 71.8
Averages				*19.06*	*13.13*	*13.49*	*68.9*	*83.8*	*15.23*	*11.50*	*7.01*	*13.26*	*87.8*	*52.9*	*10.7*	*10.26*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
12983	N. M. M.		Adult	9.2	[a] 69	[a] 58		3.18	[b] 4	*79.5*	5	2.9	*58*	5.9	6.9	*117*
52	S. A. M. A.		do	9.2	65.5	47.5		3.22	3.78	*85.2*	4.6	2.6	*56.5*	6.3	6.4	*101.6*
51	do		do	10.7	61	46		3.55	3.78	*93.9*	5.2	2.6	*50*	[b] 7.2	7	*97.2*
12989	N. M. M.		do	9.5	67.5	52	3.6	3.6	3.9	*92.3*	5.05	2.6	*49.5*	6.3	7	*111.1*
12985	do		do	8.9	74.5	55		3.5	3.75	*93.4*	4.9	2.8	*57.1*	5.7	7	*122.8*
12897	do		do	9.1	66	49		3.2	3.7	*86.5*	4.5	2.45	*54.4*	5.8	6.5	*112.1*
[1]A132	S. A. M. A.		do	9	66.5	44.5	3.4	3.48	3.95	*88.1*	4.9	2.65	*54.1*	6	6.7	*111.7*
Totals				(7) 65.6	(7)	(7)	(3) 7	(7) 23.73	(7) 26.86	(7)	(7) 34.15	(7) 18.6	(7)	(7) 43.2	(7) 47.5	(7)
Averages				*9.37*	*67*	*49*	*3.5*	*3.39*	*3.84*	*88.3*	*4.88*	*2.66*	*54.5*	*6.17*	*6.79*	*110*

[a] Whole skeleton. [b] Long ellipse. NOTE.—For footnotes to reference figures see p. 3.

SOUTH AUSTRALIAN CRANIA

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
[b]2027	S. A. M. A.	Glanville	Adult	18.3	11.8	12.1	*64.5*	*80.7*	14.07	[10] 10.4	6.8	12.3	*84.6*	*55.3*	11.2	9.6
13	A. L. A.	Reedbeds Adelaide	do	18.9	12.2	13.2	*64.6*	*84.6*	14.77	[10] 10.6	[5] 6.7				10.8	10.4
[c]158	S. A. M. A.	Meningie	do	18.6	12.1	12.4	*65*	*80.5*	14.37		[6] 6.4	12.6		*50.8*		9.8
98	do	Glenelg	do	18.3	12	12.2	*65.6*	*80.3*	14.17	[3] 10.8	6.7	12.2	*88.5*	*54.9*	10.1	9.4
[d]83	do	Lower Murray River	do	19.1	12.6	13.4	*66*	*84.8*	15.03	[4] 11.2	6.4	[1] 13.1	*85.5*	*48.8*		
[e]712	do	Dry Creek	do	18.8	12.4	13.4	*66*	*85.9*	14.87							10.6
253	do	Swanport	do	18	11.9	12.2	*66.1*	*81.3*	14.03	9.6	5.9	12.4	*77.4*	*47.6*	10.2	9.8
[f]348	do	Fulham	do	18.6	12.3		*66.1*				7	[5] 11.2		*62.5*		
[f]386	do	Syndenham	do	18.9	12.5	13.3	*66.1*	*84.7*	14.90		6.6				10.4	10
13025	N. M. M.	Port Augusta	do	19	12.6	12.3	*66.3*	*77.8*	14.63	[2] 10.7	6.7	12.5	*85.6*	*53.6*	10.7	9.7
404	S. A. M. A.	Mount Pleasant	do	18.1	12	11.9	*66.3*	*79.3*	14							9.5
110	do	Murray Bridge	do	18.5	12.3	13	*66.5*	*84.4*	14.60		6.7				10.8	10.2
[f]241	do	Swanport	do	18.9	12.6	12	*66.7*	*76*	14.50		6.1	12.2		*50*	9.9	9.6
87	do	Murray Bridge	do	18.4	12.3	12.6	*66.8*	*81.8*	14.43	[10] 11.4	6.9	[1] 12.2	*93.4*	*56.6*	11	9.9
305	do	Swanport	do	18.7	12.5	12.4	*66.8*	*79.5*	14.53		6.4	12.2		*52.5*	10	9.8
364	do	Fulham	do	18.2	12.2	12.3	*67*	*80.9*	14.23							9.9
374	do	do	do	18.5	12.4		*67*									
[f]263	do	Swanport	do	19	12.8	13.1	*67.4*	*82.4*	14.97	[2] 10.2	6.5	[5] 12.4	*82.3*	*52.4*	9.8	10
154	do	Milang	do	17.3	11.7	12	*67.6*	*82.8*	13.67	[10] 10.2	6.6	[5] 11.5	*88.7*	*57.4*	10.4	9.4
172	do	do	do	18.5	12.5	12.7	*67.6*	*81.9*	14.57		6.5				11	10.5
H_{15}	do	Near Murray Bridge	do	17.9	12.1		*67.6*									
B_4	do	Henley Beach	do	18.6	12.6	12.6	*67.7*	*80.8*	14.60							9.9
43	do	Reedbeds Adelaide	do	18.2	12.4	12.1	*68.1*	*79.1*	14.23	[10] 10.9	6.9	[5] 11.7	*93.2*	*59*	10.8	10
88	do	Murray Bridge	do	18.8	12.8	11.6	*68.1*	*73.4*	14.40	[2] 10.5	6.3	12.2	*86.1*	*51.6*	10.7	9.7
121	do	Walkerville	do	18.2	12.4	12	*68.1*	*78.4*	14.20		6.6	12		*55*	9.9	9.3
[f]286	do	Swanport	do	18.9	12.9	12.2	*68.2*	*76.7*	14.67	[4] 10.6	6.8	12.6	*84.1*	*54*	10.6	10
[f]285	do	do	do	18.9	12.9	12.9	*68.2*	*81.1*	14.90	[7] 10.2	6.4	12.5	*81.6*	*51.2*	10.3	9.8
Y	do	Yorke Peninsula	do	17.9	12.2	12.2	*68.2*	*81.3*	14.10		6.5	11.9		*54.6*	10.9	10
1366	do	Port Macleay	do	18.3	12.5	12.2	*68.3*	*79.2*	14.33	[2] 10.7	6.4	[1] (12.6)	*(84.9)*	*50.8*	10	9.3
50	do	Adelaide	do	17.4	11.9	11.6	*68.4*	*79.4*	13.63	[10] 9.7	6.4				10	9.2
165	do	Henley Beach	do	17.7	12.1	12.4	*68.4*	*83.2*	14.07	[10] 10.9	6.9	12.9	*84.5*	*53.5*	11	10.5
49	do	Reedbeds Adelaide	do	17.5	12	11.8	*68.6*	*79.7*	13.77	[10] 10.8	6.9	12.2	*88.5*	*56.6*	10.1	9.4
16563	N. M. M.	Lower Coorong	do	18.6	12.8	13.2	*68.8*	*84.1*	14.87		6.9	12.3		*56.1*	10.7	10.1
275	S. A. M. A.	Swanport	do	18.6	12.8	12.7	*68.8*	*80.9*	14.70	([10])	[13] 6.8	13.1		*51.9*	[5] 10.4	10.3

312	do	do	do	18.6	12.8	11.9	*68.8*	*75.8*	14.43	[4] 10	5.8	12.4	*80.6*	*48.8*	10.1	9.6
342	do	Mannum	do	18.3	12.6	12.9	*68.8*	*83.8*	14.60		6.6	12.9		*51.2*	10.3	9.9
[e] 340	do	Swanport	do	18.6	12.8	12.6	*68.8*	*80.2*	14.67		6.6	12.9		*51.2*	10.5	9.9
21	A. L. A.	Bimbowrie	do	18	12.4	12	*68.9*	*79*	14.13	[7] 11.2	6.9	12.4	*80.3*	*55.6*	10.1	9.9
266	S. A. M. A.	Swanport	do	18	12.4	12.3	*68.9*	*80.9*	14.23		6.5	12.5		*52*	9.8	9.7
301	do	do	do	17.7	12.2	12.8	*68.9*	*85.3*	14.23		6.6	12.8		*51.6*	10.4	10
385	do	Sydenham	do	18	12.4	12.1	*68.9*	*79.6*	14.17		6.7	12		*55.8*	9.4	9.5
(f)	Dr. Pulleine	Yorke Peninsula	do	19	13.1	12.6	*69*	*78.8*	14.90	[7] 11.1	6.8	12.9	*86*	*52.7*	10.8	10
4	A. L. A.	Mobilong	do	18.8	13	12.4	*69.2*	*78*	14.73	[7] 9.9	6.1	12.7	*78*	*48*	9.8	9.5
12	do	Lares	do	18.8	13	13	*69.2*	*81.8*	14.93	[8] 10.8	6.9	[8] 12.5	*86.4*	*55.2*	10.4	10
10	S. A. M. A.	Parallaner	do	18.2	12.6	12.3	*69.2*	*79.9*	14.37	[8] 10	[8] 6.2	12.4	*80.6*	*50*		9.4
[e] [f] 261	do	Swanport	do	18.5	12.8	13	*69.2*	*83.3*	14.77		6.3	12.9		*48.8*	10.1	9.7
[f] 272	do	do	do	18.5	12.8	12.8	*69.2*	*82*	14.70							9.4
265	do	do	do	[8] 17.3	12	12.2	*69.4*	*83.6*	13.83	[9] 9.7	5.7	12.2	*79.5*	*46.7*	9.8	9.4
439	do	Near Morgan	do	18	12.5	12.8	*69.4*	*84.2*	14.43	[9] 9.8	6.3	12.7	*77.2*	*49.6*	9.6	9.6
710	do	Near Adelaide	do	18.6	12.9		*69.4*									
R	do	MacDonnell Bay	do	18.4	12.8	13	*69.6*	*83.8*	14.73		6.3				10	10.4
16565	N. M. M.	Lower Coorong	do	18.5	12.9	13	*69.7*	*82.8*	14.80	[10] 10.8	6.9	12.7	*85*	*54.3*	10.5	10
A44	A. L. A.	Glanville	do	17.8	12.4	12.8	*69.7*	*84.8*	14.33	[4] 10.2	6.6	12	*85*	*55*	9.9	9.8
[f] 29	do	Tailem Bend	do	18.8	13.1		*69.7*									
[h] 41	do	Koombo	do	18.8	13.1	13.6	*69.7*	*85*	15.17	[7] 10	6.1	12.6	*79.4*	*48.4*	10	9.7
V	S. A. M. A.	Mt. Dulton Bay	do	18.8	13.1	11.8	*69.7*	*73.8*	14.57	[10] 10.8	7	12.8	*84.4*	*54.7*	10	9.6
B_3	do	Mallala	do	17.8	12.4	12.4	*69.7*	*82.1*	14.20							9.9
[e] H_6	do	Meningie	do	18.8	13.1	13	*69.7*	*81.2*	14.97	[9] 11.2	7.1	13.4	*83.6*	*53*	10.8	10.3
280	do	Swanport	do	18.3	12.8	12.2	*70*	*78.2*	14.43	[4] 10	6.3	13.4	*74.6*	*47*	10.2	9.7
417	do	Wood's Point	do	18.3	12.8	11.9	*70*	*76.3*	14.43	[9] 11.5	7.1				10	9.4
399	do	Coorong	do	18.4	12.9	12.6	*70.1*	*80.8*	14.63	[7] 10.2	6.3	[8] 12.7	*80.8*	*49.6*	10.6	10.2
S679	A. M. S.	Chuka Bond	do	18.1	12.7	12.6	*70.2*	*81.8*	14.47		[4] 6.6				10.2	9.6
371	S. A. M. A.	Fulham	do	17.8	12.5	13	*70.2*	*85.5*	14.43		6.3	11.7		*53.8*	10.2	9.8
"T" 4	do	Near Meningie	do	18.8	13.2	12.6	*70.2*	*78.8*	14.87		6.4	[8] 12.2		*52.5*	10.6	9.6
38	A. L. A.	Cardweene	do	18.2	12.8	11.6	*70.3*	*74.8*	14.20	[10] 10.4	(13)	12.5	*83.2*			9.5
[k] 94	S. A. M. A.	Augaston	do	18.2	12.8	13	*70.3*	*83.9*	14.67	11	6.8	12.4	*88.7*	*54.8*	9.6	9.8
281	do	Swanport	do	18.2	12.8	12.6	*70.3*	*81.3*	14.53		5.7	13.3		*42.9*	10.4	9.8
[f] 366	do	Fulham	do	18.5	13	13	*70.3*	*82.3*	14.83						10.5	9.6
3076	do	Glen Elle	do	18.2	12.8	12.4	*70.3*	*80*	14.47	[7] 10.1	6.5	12	*84.2*	*54.2*	10.4	10
K	do	Near Adelaide	do	18.2	12.8	12.3	*70.3*	*79.4*	14.43		6.5	12		*54.2*	10.4	9.6
H_5	do	Glenely	do	18.3	12.9	13	*70.5*	*83.3*	14.73	[10] 10.2	6.5	12.3	*82.9*	*52.8*	10.5	10.2
[f] 259	do	Swanport	do	18.7	13.2	13.3	*70.6*	*83.1*	15.07	[10] 9.9	6.8	12.4	*79.8*	*54.8*	9.7	10
[f] 354	do	Fulham	do	18.4	13	13	*70.6*	*82.8*	14.80							10.5
20	do	Coorong	do	17.4	12.3	11.5	*70.7*	*77.7*	13.73		6.5				9.6	9.1
[i] H	do	Port Pirie	do	18.5	13.1	12.8	*70.8*	*81*	14.80			12.3				9.6
274	do	Swanport	do	18.2	12.9	12.4	*70.9*	*79.5*	14.50		6.6	12.9		*51.2*	9.7	9.6
296	do	do	do	17.2	12.2	12.3	*70.9*	*83.7*	13.90	[9] 9.6	5.9	12.1	*79.3*	*48.8*	10.1	9.4
319	do	do	do	18.2	12.9	12.6	*70.9*	*80.8*	14.57		6.4	12.4		*51.6*	10.6	9.7
[m] 383	do	Sydenham	do	18.2	12.9	13	*70.9*	*83.3*	14.70						10.6	9.8
[n] 11406	do	Murray Bridge	do	18.6	13.2	12.8	*71*	*80.5*	14.87	[4] 11.3	6.9	12.7	*89*	*54.3*	10.4	10
[n] 11460	do	Campbelltown	do	18.6	13.2	13.2	*71*	*83*	15		(13)					10.4
95	do	Mannum	do	18	12.8	12	*71.1*	*77.9*	14.27		6.6	12.2		*54.1*	9.8	9.2
[f] 306	do	Swanport	do	18	12.8	13.3	*71.1*	*86.4*	14.70	[9] 10.7	6.6	12.7	*84.2*	*52*	10.2	9.6
J(351)	do	Fulham	do	18	12.8		*71.1*									
A903	do	Near Adelaide	do	18	12.8	13.5	*71.1*	*87.7*	14.77							9.6

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 47.

SOUTH AUSTRALIAN CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
7	A. L. A.	Middleton	Adult	18.8	13.4	13.2	*71.3*	*82*	15.13		(35)					10.1
82	S. A. M. A.	Near Adelaide	do.	17.4	12.4	12	*71.3*	*80.5*	13.93	[2] 10.4	7	[5] 12.1	*86*	*57.8*	9.9	9.4
299	do.	Swanport	Near adult	18.1	12.9	12.4	*71.3*	*80*	14.47	[9] 10.3	6.4	[5] 12.8	*80.5*	*50*	10.2	9.4
242	do.	do.	Adult	17.9	12.8	12.2	*71.5*	*79.2*	14.30	[9] 10.5	6.4	[5] 12.9	*81.4*	*49.6*	10.5	9.8
390	do.	Meningie	do.	17.9	12.8	11.6	*71.5*	*75.3*	14.10	[7] 10.3	6.7	11.9	*86.6*	*56.3*	10.9	9.6
422	do.	Port Victor	do.	18.6	13.3	11.8	*71.5*	*73.8*	14.57		6.4	12.5		*51.2*	10	9.4
220	do.	Zoological Gardens	do.	17.6	12.6	12.7	*71.6*	*84.1*	14.30	[10] 10	6.2	11.9	*84*	*52.1*	10.3	9.2
359	do.	Fulham	do.	19	13.6		*71.6*									
412	do.	Ardrossan	do.	18.3	13.1	11.8	*71.6*	*75.2*	14.40	[10] 9.7	6.3	12.1	*80.2*	*52.1*	9.8	9
A_4	do.	Quorn	do.	17.6	12.6	12.4	*71.6*	*82.1*	14.20		6.5	12.6		*51.6*	10.4	9.7
245	do.	Swanport	do.	18.7	13.4	12.7	*71.7*	*79.4*	14.93	[4] 10.4	5.9	13.3	*78.2*	*44.4*	10.3	9.9
357	do.	Fulham	do.	18.4	13.2		*71.7*									
387	do.	Sydenham	do.	18.1	13	12.6	*71.8*	*80.8*	14.57		6.8	12.6		*54*	10.4	9.8
A_2	do.	Loxon	do.	17.7	12.7	12.2	*71.8*	*80.3*	14.20	[7] 9.9	5.9	12.2	*81.2*	*48.4*	9.7	9.3
12961	N. M. N.	Port Lincoln	do.	17.8	12.8	12.2	*71.9*	*79.7*	14.27	[7] 9.9	6.1	12.3	*80.5*	*49.6*	10	9.4
164	S. A. M. A.	Port Augusta	do.	17.8	12.8	13	*71.9*	*85*	14.53		7.3	[5] 12.3		*59.4*	10.8	10
13A	do.	Lower Coorong	do.	17.8	12.8	12.3	*71.9*	*80.4*	14.30	[27] 9.7	5.8	12.2	*79.5*	*47.5*	9.6	9.4
O	do.	Upper Coorong	do.	18.2	13.1	12.5	*72*	*80.1*	14.60	[9] 10.6	6.4	[5] 12.3	*86.2*	*52*	9.6	9.4
15	A. L. A.	Ardrossan	do.	18.3	13.2	12.6	*72.1*	*79.8*	14.70	10.9	6.5	12.8	*85.2*	*50.8*	10.2	9.6
350	S. A. M. A.	Fulham	do.	18.3	13.2	12.7	*72.1*	*80.4*	14.73							9.6
X	do.	Yorke Peninsula	do.	17.2	12.4	12.2	*72.1*	*82.4*	13.93		6.6	12.1		*54.6*	9.3	9
	Dr. Basedow's	do.	do.	18	13	12.4	*72.2*	*80*	14.47	[9] 10.8	6.9	12.3	*87.8*	*56.1*	10.2	9.8
235	S. A. M. A.	Swanport	do.	18	13	12.6	*72.2*	*81.3*	14.53							9.6
343	do.	do.	do.	18	13	12.7	*72.2*	*81.9*	14.57	[3] 9.8	6.3	13.3	*73.7*	*47.4*	10.1	9.8
358	do.	Fulham	do.	18	13		*72.2*									
H_{11}	do.	Inkennan	do.	18.4	[5] 13.3	12	*72.3*	*76*	14.57		6.7				10.6	9.6
406	do.	Narrung, Lake Albert	do.	18.5	13.4	12.7	*72.4*	*79.4*	14.87		6.3				10.3	10.2
407	do.	Henley Beach	do.	18.1	13.1		*72.4*				6.3					
[11] 415	do.	Near Mount Gambier	do.	17.4	12.6	13	*72.4*	*86.7*	14.33	[4] 9.6	5.9	12.1	*79.3*	*48.8*	9.7	9.6
167	do.	Cape Northumberland	do.	17.1	12.4	12.8	*72.5*	*86.5*	14.10	[9] 10.9	6.5	11.6	*94*	*56*	9.5	9.1
90	do.	Coorong	do.	17.9	13	12.2	*72.6*	*79.3*	14.37	11.5	6.7	12.4	*92.7*	*54*	9.8	9.5
316	do.	Swanport	do.	17.9	13	12.8	*72.6*	*83.1*	14.57							9.5
438	do.	Glenelg	do.	16.8	12.2	11.8	*72.6*	*81.4*	13.60	[10] 9.2	6	[1] (11.8)	(78)	*(50.8)*	9.5	9
C	do.	Near Adelaide	do.	17.9	13	12.8	*72.6*	*83.1*	14.57	[9] 10.9	6.7	12.4	*87.9*	*54*	10.6	10.1
H_{10}	do.	Near Meningie	do.	18.6	13.5	12.1	*72.6*	*75.6*	14.73		[5,6] 7	12.7		*55.1*	9.6	10

338	do	Swanport	do	17.6	12.8	[5] 12.1	*72.7*	*79.6*	14.17		5.8	12.3		*47.2*	9.6	9.8
370	do	Fulham	do	18	13.1		*72.8*									
103	do	Plympton	do	17	12.4	11.5	*72.9*	*78.2*	13.63	[7] 11.1	7	12.2	*91*	*57.4*	10.3	9.6
[f] T3	do	Near Meningie	do	18.8	13.7	(39)	*72.9*			[11] 11	6.6	12.9	*85.3*	*51.2*		
34	do	Goolwa	Adolescent	17.8	13	11.4	*73*	*74*	14.07							
251	do	Swanport	do	17.8	13	11.9	*73*	*77.3*	14.23	[4] 10.6	6.7	13	*81.5*	*51.5*	10.1	9.4
2189	do	Lower Meningie	do	17.8	13	13	*73*	*84.4*	14.60	[7] 10.9	6.7	13	*83.8*	*51.5*	9.7	9.6
249	do	Swanport	do	17.5	12.8	12.1	*73.1*	*79.6*	14.13		6.6	12.8		*51.6*	10.3	9.2
[f] T	do	Coorong	do	18.6	13.6	12.6	*73.1*	*78.3*	14.93							10.7
[f] W	do	Edithbury	do	18.6	13.6	12.6	*73.1*	*78.3*	14.93							9.7
269	do	Swanport	do	17.2	12.6	12.2	*73.3*	*81.9*	14	[10] 10.6	7.2	11.8	*89.8*	*61*	9.6	9.4
• 42	do	Adelaide	do	17.7	13	13.1	*73.4*	*85.1*	14.60							10
276	do	Swanport	do	17.7	[5] 13	12.4	*73.4*	*80.5*	14.37	[4] 10.4	6.1				10.2	9.6
H7	do	Coorong	do	18.4	13.5	11.9	*73.4*	*74.4*	14.60	[2] 10.8	6.9	12.7	*85*	*54.3*	10.2	9.5
320	do	Swanport	do	17.8	13.1	12.2	*73.6*	*79.2*	14.37							9.5
347	do	Fulham	do	18.2	13.4	11.8	*73.6*	*74.7*	14.47		[5] 6.5	12.6		*51.6*	10.6	9.6
401	do	Robe	do	17.4	12.8	12.6	*73.6*	*83.4*	14.27		6.4	13.3		*48.1*	9.8	9.6
B	do	Near Adelaide	do	18.2	13.4	12.5	*73.6*	*79.1*	14.70	10.3	6.7	12.8	*80.5*	*52.3*	9.7	9.4
437	do	Tantanoola	do	17.9	13.2	12.6	*73.7*	*80.8*	14.57	(32)	6.8	13.3		*51.1*	10.8	10.1
[f] 8	A. L. A.	Middleton	do	18	13.3	12.6	*73.9*	*80.8*	14.63			12				9.5
[f] 30	do	Tailem Bend	do	18.4	13.6	13.4	*73.9*	*83.8*	15.13							10
96	S. A. M. A.	Murray River	do	18	13.3	11.8	*73.9*	*75.6*	14.37		6.4				10.8	9.6
271	do	Swanport	do	17.6	[5] 13	11.8	*73.9*	*77.1*	14.13		6.5	12.7		*51.2*	9.6	9
[f] 1035	do	Yorke Peninsula	do	17.6	13	12.6	*73.9*	*82.4*	14.40	[6] 10.8	6.7	12.5	*86.4*	*53.6*	9.5	9.4
[f] 333	do	Swanport	do	18.6	13.8		*74.2*									
	Dr. Basedow's	Lower Murray River	do	18.3	13.6	12.1	*74.3*	*75.6*	14.67		6.4	12.9		*49.6*	10.2	9.6
243	S. A. M. A.	Swanport	do	18	13.4	13.1	*74.4*	*83.4*	14.83	[10] 10.4	6.4	[3] 12.9	*80.6*	*49.6*	10.4	10.1
413	do	Ardrossan	do	18	13.4	12.8	*74.4*	*81.5*	14.73	[2] 10.4	[6] 6.5	[3] 13	*80*	*50*	10.5	10
[f] 302	do	Coorong	do	18.8	14	13.3	*74.5*	*81.1*	15.37							10.7
268	do	Swanport	do	17	12.8	12.4	*75.3*	*83.2*	14.07		6.5	12.3		*52.8*	9.7	9.4
91	do	Coorong	do	18.2	13.8	12.3	*75.8*	*76.9*	14.77	[2] 10.4	6.4	13.4	*77.6*	*47.8*	10.5	9.8
B19	do	Mt. Gambier	do	18.2	13.8	12.5	*75.8*	*78.1*	14.83	[7] 10.2	6.3	12.8	*79.7*	*49.2*	9.7	9.4
[f] 42	A. L. A.	Robe	do	17.1	13	12.6	*76*	*84*	14.23	[9] 11.1	6.6	11.9	*93.3*	*55.5*	10.1	9.6
341	S. A. M. A.	Swanport	do	16.5	12.6	13.3	*76.4*	*91.1*	14.13		5.8	12		*48.3*	9.3	9.1
[e] F	do	Coffin Bay	do	18.2	13.9	12.6	*76.4*	*78.8*	14.90	[9] 11.3	7	13.8	*81.9*	*50.7*	10.4	10.2
[b] 1081	do	Wallaroo	do	18.1	14.4	13	*79.6*	*80.2*	15.17	[2] 11.8	7.4	13.9	*84.9*	*53.2*	11.2	10.3
Totals				(186) 2,832.9	(156) 2,003.5	(143) 1,787.5	(150)	(148)	(143)	(76) 797.2	(121) 789.4	(108) 1,350.6	(76)	(106)	(117) 1,192.9	(141) 1,371.3
Averages				*18.16*	*12.84*	*12.5*	70.7	*80.7*	*14.49*	*10.49*	*6.52*	*12.5*	*83.8*	*52.2*	*10.2*	*9.72*
Minima				16.5	11.7	11.4	*64.5*	*73.4*	13.60	9.2	5.7	11.2	*73.7*	*42.9*	9.3	9
Maxima				19.1	14.4	13.6	*79.6*	*91.1*	15.37	11.8	7.4	13.9	*94*	*62.5*	11.2	10.7

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 47.

SOUTH AUSTRALIAN CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°										
[b]2027	S. A. M. A.	Glanville	Adult	9.6	58.5	45	3.4	3.08	3.6	*85.6*	4.4	2.8	*63.6*	6.		*95.*
13	A. L. A.	Reedbeds Adelaide	do	9.6	68.5	51	3.4	3.35	3.8	*88.1*	4.7	2.7	*57.4*	6.		*95.*
[e]158	S. A. M. A.	Meningie	do	8.9				3.22	3.85	*83.6*	4.45	2.9	*65.2*			
98	do	Glenelg	do	8.6	64.5	47.5		3.35	3.62	*92.5*	[18]4.4	2.4	*54.6*		5.	*100*
[d]83	do	Lower Murray River	do					[19]3.4	[19]3.8	*89.5*	4.9	2.2	*44.9*		6.	*106.*
[e]712	do	Dry Creek	do													
253	do	Swanport	do	9.2	69.5	50.5	2.85	3.3	3.7	*89.2*	4.3	2.4	*55.*	5.		*106.*
[f]348	do	Fulham	do					3.8	3.85	*98.7*	5.1	2.65	*52*	5.		*99.*
[f]386	do	Sydenham	do	9.5	68	61		3.35	3.8	*88.1*	4.4	2.55	*58*	5.		*117*
13025	N. M. M.	Port Augusta	do	9.3	63	50	3.7	3.5	3.95	*88.6*	4.3	2.8	*65*	6.		*96.*
404	S. A. M. A.	Mount Pleasant	do													
110	do	Murray Bridge	do	9.6	66.5	42.5		(37)	(37)		2	2.				
[f]241	do	Swanport	do	8.8	69	51		3.35	3.58	*93.6*	4.3	2.6		5.7	6.2	*108.*
87	do	Murray Bridge	do	9.4	62	47		3.2	4.1	*78*	4.4	2.5		6.8	6.6	*97.*
305	do	Swanport	do	8.8	69	49		3.28	3.62	*90.6*	4.55	2.35		5.7	6.1	*107*
364	do	Fulham	do													
374	do	do	do													
[f]263	do	Swanport	do	8.8	72.5	53.5	3	33.2	3.75	*88.5*	4.7	2.5	*52.*		6	*97.1*
154	do	Milang	do	9	62.5	48	3.3	3.38	3.55	*95.2*	4.4	2.5	*56.*		6.	*94.9*
172	do	do	do	9.8	68	51.5		[19]3.4	[19]3.6	*94.4*	4.45	2.6	*59.*			
H_{15}	do	Near Murray Bridge	do													
B_4	do	Henley Beach	do													
43	do	Reedbeds Adelaide	do	9.4	64.5	48		3.35	3.8	*88.1*	4.75	2.4	*50.5*	6.	6.5	*104.8*
88	do	Murray Bridge	do	9.2	63.5	41		3.25	3.8	*85.5*	4.4	2.5	*56.8*	6.	5.9	*98.7*
121	do	Walkerville	do	8.6	65.5	50		3.18	3.62	*87.8*	4.5	2.35	*52.2*	6	6.3	*105*
[f]286	do	Swanport	do	9.2	6.5	50	3	3.4	3.68	*92.4*	4.5	2.4	*53.3*	6.	6.2	*101.6*
[f]285	do	do	do	9.2	67.5	52.5	2.85	3.25	3.72	*87.4*	4.5	2.55	*56.7*	5.	6.4	*108.5*
Y	do	Yorke Peninsula	do	9.5	64.5	45.5		3.05	3.6	*84.7*	4.5	2.55	*56.*	6.	6.4	*103.2*
1366	do	Port Macleay	do	8.8	65	49.5	3.05	[19]3.45	[19]3.8	*89.6*	4.5	2.5	*55.*			
50	do	Adelaide	do	9	64	53.5		[19]3.4	[19]3.7	*91.9*	4.5	2.55	*56.*			
165	do	Henley Beach	do	9.8	67.5	51	3.3	3.4	3.8	*89.5*	4.9	2.5	*51*	6.2	6.2	*100*
49	do	Reedbeds Adelaide	do	8.6	64	49		3.55	3.75	*94.7*	4.4	2.45	*55.*	5.8	6	*103.*
16563	N. M. M.	Lower Coorong	do	9.4	66	51		3.32	3.65	*91*	4.65	2.3	*49.*	6.1	6.2	*101.*
275	S. A. M. A.	Swanport	do	9.2	70	51	3.2	3.42	3.92	*87.2*	4.8	2.65	*55.*	5.9	6.3	*106.*

312	do	do	do	8.6	68	38.5	2.7	3.22	3.6	*89.5*	[18] 4.15	2.3	*55.4*	5.8	6.2	*106.9*
342	do	Mannum	do	8.9	68	44.5		3.22	3.75	*85.9*	4.75	2.75	*57.9*	6.1	6.5	*106.6*
[e] 340	do	Swanport	do	9.3	66.5	51		3.28	3.85	*85.2*	4.55	2.65	*58.2*	5.8	6.8	*117.2*
21	A. L. A.	Bimbowrie	do	8.8	68	50	3.35	3.42	3.75	*91.2*	4.8	2.65	*55.2*	6	6.8	*113.3*
266	S. A. M. A.	Swanport	do	8.7	69.5	51		2.98	3.5	*85.1*	4.65	2.3	*49.5*	5.6	5.8	*103.6*
301	do	do	do	9	68	48		3.42	3.75	*91.2*	[18] 4.4	2.5	*56.8*	5.8	6.5	*112.1*
385	do	Sydenham	do	8.4	70	57.5		3.58	3.78	*94.7*	4.5	2.5	*55.6*	5.5	6	*109.1*
(f)	Dr. Pulleine	Yorke Peninsula	do	9.4	65	47	3.5	3.25	3.8	*85.5*	4.7	2.45	*52.1*	6.7	6.3	*94*
4	A. L. A.	Mobilong	do	8.8	69	50.5	2.9	3	3.65	*82.2*	4.5	2.3	*51.1*	6	6.3	*105*
12	do	Lares	do	9.3	67	55.5	3.3	3.5	3.5	*100*	[18] 4.7	2.7	*57.4*	6.3	6.8	*107.9*
10	S. A. M. A.	Parallaner	do	8.6				3.15	3.85	*81.8*	3.6	2.4	*66.7*	[5 13] 5.7	6.6	*115.8*
[f] 261	do	Swanport	do	9.1	68	53		3.22	3.48	*92.5*	4.5	2.5	*55.6*	5.7	6.3	*110.5*
[f] 272	do	do	do													
265	do	do	do	8.8	69	48	2.7	3.45	3.8	*90.8*	[18] 4.2	2.55	*60.7*	5.5	5.8	*105.4*
439	do	Near Morgan	do	8.6	71	51	2.8	3.35	3.75	*89.3*	[18] 4.65	2.55	*54.8*	5.7	6	*106.3*
710	do	Near Adelaide	do													
R	do	MacDonnell Bay	do	9	75.5	54		[20] 3.4	[20] 3.7	*91.9*	4.55	2.8	*61.5*			
16565	N. M. M.	Lower Coorong	do	9.2	67	49.5	3.5	3.4	4.15	*81.9*	[18] 4.85	2.5	*51.6*	6.1	6.4	*104.9*
A44	A. L. A.	Glanville	do	8.9	69.5	53.5	2.9	3.52	3.7	*95.1*	4.75	2.3	*48.4*	5.7	5.9	*103.5*
[f] 29	do	Tailem Bend	do													
[h] 41	do	Koombo	do	8.8	69.5	47	3	2.9	3.7	*78.4*	4.4	2.85	*64.8*	6	6.7	*111.7*
V	S. A. M. A.	Mt. Dulton Bay	do	9.1	66	62	3.3	3.58	3.88	*92.3*	4.55	2.3	*50.6*	5.8	6.2	*106.9*
B_2	do	Mallala	do													
[e] H_9	do	Meningie	do	9.6	66.5	54	3.4	3.5	3.92	*89.3*	[18] 4.85	2.35	*48.5*	6.3	6.8	*107.9*
280	do	Swanport	do	9.2	67	52.5	2.8	3.5	3.92	*89.3*	4.55	2.55	*56*	5.9	6.7	*113.6*
417	do	Woods Point	do	8.5	64	49	3.5				4.65	2.65	*57*	6.1	6.1	*100*
399	do	Coorong	do	9.4	69.5	48.5	3	3.15	3.75	*84*	4.5	3.35	*74.4*	5.9	6.1	*103.4*
S679	A. M. S.	Chuka Bond	do	8.9	66	50.5		3.25	3.65	*89*	4.4	2.5	*56.8*	6	6.4	*106.7*
371	S. A. M. A.	Fulham	do	9	68.5	50.5	2.8	3.38	3.8	*88.9*	4.35	2.3	*52.9*			
[i] "T"4	do	Near Meningie	do	9	63.5	41		3.35	[20] 3.9	*85.9*	4.4	2.15	*48.9*			
38	A. L. A.	Cardweene	do	8.4			3.2	3.2	3.8	*84.2*	4.7	2.8	*59.6*			
[h] 94	S. A. M. A.	Augaston	do	8.6	71	55		3.35	3.82	*87.7*	4.95	2.6	*52.5*	5.5	6.7	*121.8*
281	do	Swanport	do	8.9	68	41.5		3.18	3.88	*88*	[18] 3.9	2.6	*66.7*	6.3	6.3	*100*
[f] 366	do	Fulham	do	9.4			3									
3076	do	Glen Elle	do	9.2	68	47	2.75	3.58	3.75	*95.5*	[18] 4.75	2.55	*53.7*	5.7	6.7	*117.5*
K	do	Near Adelaide	do	8.8	64.5	42	2.85	3.28	3.75	*87.5*	[18] 4.45	2.55	*57.3*	6	5.8	*96.7*
H_3	do	Glenely	do	9.3	69.5	52	[5] 3.2	3.35	3.85	*87*	4.5	2.5	*55.6*	6	6.5	*108.3*
[f] 259	do	Swanport	do	8.6	72.5	54.5	[6] 2.6	3.55	3.68	*96.5*	[18] 4.75	2.35	*49.5*	5.7	6.3	*110.5*
[f] 354	do	Fulham	do													
20	do	Coorong	do	8.4	65.5	50.5		3.15	3.52	*89.5*	[18] 4.5	2.25	*60*	5.5	5.7	*103.6*
[i] H	do	Port Pirie	do	9			3	3.38	3.58	*94.4*	4.5	2.3	*51.1*			
274	do	Swanport	do	8.4	69	48		3.62	3.8	*95.3*	[18] 4.6	2.55	*55.4*	5.7	6	*105.3*
296	do	do	do	8.9	66	48	2.8	3.2	3.5	*91.4*	4.15	2.5	*60.2*	5.8	6.2	*106.9*
319	do	do	do	9.2	64.5	44		3.2	3.75	*85.4*	4.5	2.6	*57.8*	6.2	6.7	*108.1*
[m] 383	do	Sydenham	do	9.1				3.62	4	*90.5*	4.9	2.6	*53.1*	6.2	6.6	*106.4*
[n] 11406	do	Murray Bridge	do	9	67	51	3.5	3.32	3.75	*88.5*	4.5	2.7	*60*	6	6.5	*108.3*
[o] 11460	do	Campbelltown	do	9.2			3.4	3.55	3.7	*95.9*	4.65	2.5	*53.8*			
95	do	Mannum	do	8.3	65	42		3.4	3.8	*89.5*	4.65	2.8	*60.2*	5.7	6.2	*108.8*
[f] 306	do	Swanport	do	9.2	66	57	2.95	[20] 3.2	[20] 3.65	*87.7*	4.5	2.6	*57.8*	5.7	6.8	*119.3*
J(351)	do	Fulham	do													
A903	do	Near Adelaide	do													

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 47.

SOUTH AUSTRALIAN CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°										
7	A. L. A.	Middleton	Adult	8.8				3.3	[8] 3.75	*88*	5.1	2.8	*54.9*			
82	S. A. M. A.	Near Adelaide	do	8.7	65	54		[20] 3.6	[20] 3.6	*100*	[18] 4.7	2.6	*55.3*	5.8	6.1	*105.2*
290	do	Swanport	Near adult	8.8	64.5	46	3	[10] 3.3	[10] 3.8	*86.8*	4.35	2.55	*58.6*	6.1	6.5	*106.6*
242	do	do	Adult	9.1	66	41	3.15	3.35	3.7	*90.5*	4.7	2.7	*57.4*	6	5.9	*98.3*
390	do	Meningie	do	9.3	61	42	3.1	3.2	3.7	*86.5*	4.6	2.5	*54.4*	6.4	6.2	*96.9*
422	do	Port Victor	do	8.6	66	38.5		3.6	3.95	*91.1*	[18] 4.8	2.6	*54.2*	6.2	6.4	*103.2*
220	do	Zoological Gardens	do	9	62	42	3.4	2.98	3.58	*83.2*	[18] 4.5	2.35	*52.2*	6	6.5	*108.3*
350	do	Fulham	do													
412	do	Ardrossan	do	8.6	64	53	3	3.15	3.68	*85.6*	4.05	2.35	*58*	5.7	5.8	*101.8*
A_4	do	Quorn	do	9.1	65.5	48	2.95	3.1	3.65	*84.9*	[18] 4.5	2.3	*51.1*	5.7	6.3	*110.5*
245	do	Swanport	do	9	69.5	40	3.05	3.45	3.7	*93.2*	[18] 4.45	2.7	*60.7*	5.9	6.3	*106.8*
357	do	Fulham	do													
387	do	Sydenham	do	9.1	65.5	48.5		3.22	3.6	*89.5*	[18] 4.8	2.55	*53.1*	6	6.2	*103.3*
A_3	do	Loxton	do	8.8	68.5	56	3	3.15	3.35	*94*	4.15	2.7	*65.1*	5.7	6.3	*110.5*
12061	N. M. M.	Port Lincoln	do	8.7	66.5	42.5	2.8	3.2	3.55	*90.1*	4.45	2.1	*47.2*	5.8	6.1	*105.2*
164	S. A. M. A.	Port Augusta	do	9.2	64	46		3.32	[8] 3.65	*91*	4.9	3.05	*62.2*	6.1	6.5	*106.6*
13A	do	Lower Coorong	do	8.6	70.5	50	2.8	3.28	3.7	88.7	4.3	2.3	*53.3*	5.6	5.9	*105.4*
O	do	Upper Coorong	do	8.5	69	52.5	3.1	3.6	3.72	*96.8*	4.5	2.4	*53.3*	5.6	6.3	*112.5*
15	A. L. A.	Ardrossan	do	8.6	66	38.5	2.8	3.15	3.75	*84*	[18] 4.7	2.35	*50*	6	6.2	*103.3*
350	S. A. M. A.	Fulham	do													
X	do	Yorke Peninsula	do	8.2	66.5	50		3.15	3.7	*85.1*	4.75	2.45	*51.6*	5.4	6	*111.1*
	Dr. Basedow's	do	do	9	67	52	3.1	3.35	3.68	*91*	4.8	2.55	*53.1*	6.1	6.6	*108.2*
235	S. A. M. A.	Swanport	do													
343	do	do	do	9.2	69	49.5	2.8	3.68	3.75	*98.1*	4.9	2.7	*55.1*	5.8	6.2	*106.9*
358	do	Fulham	do													
H_{11}	do	Inkennan	do	9.1	63	45.5		[20] 3.1	[20] 3.8	*81.6*	4.5	2.7	*60*			
406	do	Narrung, Lake Albert	do	9	71	51		3.2	4	*80*	4.2	2.65	*63.1*	5.8	6.6	*113.8*
407	do	Henley Beach	do				3	3.28	3.75	*87.5*	4.45	2.6	*58.4*			
11415	do	Near Mount Gambier	do	8.8	71	50	3	3.32	3.7	*89.7*	4.2	2.5	*59.5*	5.5	5.9	*107.2*
167	do	Cape Northumberland	do	8.3	66.5	53.5	3.4	3.22	3.75	*85.9*	4.25	2.5	*58.8*	5.9	6.3	*106.8*
90	do	Coorong	do	9	67	61		3.32	3.95	*84*	[18] 4.75	2.35	*49.5*	5.6	6.7	*119.6*
316	do	Swanport														
438	do	Glenelg	do	8.6	67	53.5	2.6	3.15	3.65	*86.3*	[18] 4.35	2.35	*54*	5.3	5.8	*109.4*
C	do	Near Adelaide	do	9.4	67	51	3.3	3.35	3.75	*89.3*	4.7	2.5	*53.2*	6.1	6.8	*111.5*
H_{18}	do	Near Meningie	do	8.4	72	52		3.08	3.55	*86.8*	[18] 4.9	2.6	*53.1*	5.5	6.2	*112.7*

338	do	Swanport	do	8.7	75	51.5		3.32	3.48	*95.4*	[18] 4.35	2.8	*62.9*			
370	do	Fulham	do													
103	do	Plympton	do	9.2	64	56		3.1	3.6	*86.1*	[18] 4.7	2.25	*47.9*	6.1	6.5	*108.6*
[r] T3	do	Near Meningie	do				3.2	3.12	3.95	*79*	4.5	2.5	*55.6*	6	6.4	*106.7*
34	do	Goolwa	Adolescent													
251	do	Swanport	do	8.8	64	47	3.2	3.38	3.6	*93.9*	4.75	2.6	*54.7*	5.9	6.6	*111.9*
1189	do	Lower Meningie	do	8.5	69	50.5	2.8	3.35	3.9	*85.9*	4.7	2.4	*51.1*	5.9	6.6	*111.9*
249	do	Swanport	do	8.8	61.5	44.5		3.18	3.62	*87.8*	[18] 4.45	2.55	*56*	5.8	6.5	*112.1*
[f] T	do	Coorong	do					[20] 3.45	[20] 3.9	*88.5*						
[r] W	do	Edithbury	do													
269	do	Swanport	do	8.5	66	53.5	2.8	3.65	3.78	*96.6*	[18] 5.15	2.45	*47.6*	5.9	6.3	*106.8*
42	do	Adelaide	do	9.5				3.15	3.9	*80.8*	4.7	2.9	*61.7*			
276	do	Swanport	do	8.7	67	40.5	3.35	3.45	3.8	*90.8*	[18] 4.3	2.6	*60.5*	6.1	6.5	*106.6*
H7	do	Coorong	do	8.8	64.5	50	3.25	3.18	3.7	*85.9*	[18] 4.5	2.55	*56.7*	5.8	6.5	*112.1*
320	do	Swanport	do													
347	do	Fulham	do	9	63	39		3.4	3.75	*90.7*	4.6	2.6	*56.5*	6.1	6.6	*108.2*
401	do	Robe	do	8.6	69	47		3.42	3.78	*90.5*	[18] 4.65	2.25	*48.4*	5.7	6.5	*114*
B	do	Near Adelaide	do	8.7	67	53	2.8	3.4	3.65	*93.2*	[18] 4.9	2.35	*48*	5.6	6.3	*112.5*
437	do	Tantanoola	do	9.5	65.5	52	2.8	3.55	3.95	*89.9*	4.5	3	*66.7*	6.1	6.8	*111.5*
[f] 8	A. L. A	Middleton	do													
[f] 30	do	Tailem Bend	do													
96	S. A. M. A	Murray River	do	9.2	62	36.5		3.02	3.65	*82.7*	4.6	2.65	*57.6*	6.1	6.6	*108.2*
271	do	Swanport	do	8.2	65	42.5		3.3	3.8	*86.8*	[18] 4.65	2.4	*51.6*	5.7	6.6	*115.8*
[i] 1035	do	Yorke Peninsula	do	8.4	68.5	50	2.8	3.6	3.85	*93.5*	[18] 4.9	2.2	*44.9*	5.6	6.2	*110.7*
[f] 333	do	Swanport	do													
	Dr. Basedow's	Lower Murray River	do	8.8	66	45		3.5	3.8	*92.1*	4.45	2.65	*59.5*	5.8	6.6	*113.8*
243	S. A. M. A	Swanport	do	9.2	69.5	51	3.2	3.18	3.78	*84.1*	4.4	2.35	*53.4*	6	5.8	*96.7*
413	do	Ardrossan	do	9.4	67.5	49	3	3.18	3.7	*85.9*	4.8	2.55	*53.1*	6	6.8	*113.3*
[f] 392	do	Coorong	do				3.3									
268	do	Swanport	do	8.5	68	51		3.42	3.8	*90*	[18] 4.5	2.55	*56.7*	5.9	5.7	*96.6*
91	do	Coorong	do	9	66	43		3.22	3.85	*83.6*	[18] 4.4	2.4	*54.6*	5.9	6	*101.7*
B10	do	Mt. Gambier	do	8.5	68.5	51.5	2.9	3.32	3.62	*91.7*	4.25	2.8	*65.9*	5.7	6.2	*108.8*
[f] 42	A. L. A	Robe	do	8.7	66.5	46	3.4	3.62	3.7	*97.8*	[18] 4.6	2.75	*59.8*	6.1	6.8	*111.5*
341	S. A. M. A	Swanport	do	8.5	70	54		3.35	3.72	*90.1*	[18] 4.4	2.3	*52.3*	5.3	6.2	*117*
[e] F	do	Coffin Bay	do	9	68.5	46	3.1	3.48	3.8	*91.6*	5.05	2.45	*48.5*	6	6.8	*113.3*
[b] 1081	do	Wallaroo	do	10	63.5	57.5	[s] 3.9	3.42	3.8	*90*	4.7	2.7	*57.4*	6.7	6.7	*100*
Totals				(124) 1,109.8	(115)	(115)	(73) 224.9	(128) 419.26	(128) 471.16	(128)	(127) 579.55	(127) 321.35	(127)	(111) 656.4	(111) 701.95	(111)
Average				*8.95*	*67*	*49*	*3.08*	*3.33*	*3.74*	89	*4.56*	*2.53*	55.5	*5.91*	*6.32*	*106.9*
Minima				8.2	58.5	36.5	2.6	2.9	3.35	78	3.6	2.1	*44.9*	5.3	5.7	*94*
Maxima				10	75.5	62	3.9	3.8	4.1	*100*	5.2	3.05	*74.4*	6.8	6.9	*121.8*

[a] No allowance made for wear in any case. [b] Tall female. [c] Somewhat male-like, but probably female. [d] Looks more like female than male.
[e] Tall, strong female. [f] Surely female. [g] Looks (supraorbital ridges) somewhat male-like, but is female. [h] Dissected.
[i] Left anterior premolar probably knocked out. [j] Tealuck tribe. [k] Tarrawatta tribe. [l] Whole skeleton.
[m] Somewhat male-like (height of jaw) but more likely female. [n] Tall massive female. [o] Pelvis and part of skeleton. [p] Thick and massive skull.
[q] Bull-Bull tribe. [r] Large female; Tealuck tribe. [s] Part of skeleton; evidently a large female. NOTE.—For footnotes to reference figures, see p. 3.

NORTHERN TERRITORY CRANIA

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
197	S. A. M. A.	Anson Bay	Adult	18.1	11.6	12.2	*64.1*	*82.4*	13.97		6.9	11.9		*58*	10.2	10
227	do	Melville Island	do	18.4	11.8	12.8	*64.1*	*84.8*	14.33	[7] 10.4	6.4	12.2	*85.2*	*52.5*	10.3	10.2
443	do		do	17.7	11.8	13.2	*66.7*	*89.2*	14.23		6.5	12.2		*53.3*	10.2	10.2
	Dr. Basedow's	Humbert River	do	18.5	12.4	(39)	*67*									
380	S. A. M. A.	Melville Island	do	18.5	12.4	13.4	*67*	*87*	14.77							10.1
[a] 11411	do		do	18.8	12.6	13.5	*67*	*86*	14.97			12.2				10
16119	N. M. M.		do	17.7	11.9	12.7	*67.2*	*85.8*	14.10	[4] 10.2	6.6	12.2	*83.6*	*54.1*	10	9.6
[a] 11452	S. A. M. A.	Melville Island	do	18.4	12.4	12.8	*67.4*	*83.1*	14.53	[7] 11.2	[6] 6.8	12.3	*91.1*	*55.3*	10	9.8
16109	N. M. M.		do	18.4	12.4	12.9	*67.4*	*83.8*	14.57	[2] 11	6.8	13	*84.6*	*52.3*	10.6	9.9
180	S. A. M. A.	Anson Bay	do	17.4	11.8	12.4	*67.8*	*84.9*	13.87	[7] 11.1	[5] 6.2	12.5	*88.8*	*49.6*		9.6
190	do	do	do	17.2	11.7	12.4	*68*	*86.1*	13.77	[7] 9.7	6	12.1	*80.2*	*49.6*	9.6	9.4
201	do	do	do	17.6	12	12.6	*68.2*	*85.1*	14.07	[10] 10.6	7.1	12.3	*86.2*	*57.7*	10.8	9.8
144	do		do	17.5	12	12.6	*68.6*	*85.1*	14.03		6	12.6		*47.6*	10.3	10
16378	N. M. M.		do	18.3	12.6	12.6	*68.8*	*81.8*	14.50		6.5	12.6		*51.6*	10.7	10
17082	do		do	18.3	12.6	13.5	*68.8*	*87.7*	14.80		[5 13] 7.1	12.6		*56.4*		10
213	S. A. M. A.	Borroloola	do	18	12.4	13.6	*68.9*	*89.5*	14.67		6.9	12.8		*53.9*	10.6	10.6
177	do	Anson Bay	do	17.8	12.3	12.3	*69.1*	*82*	14.13	[10] 9.5	6.2	12.7	*74.8*	*48.8*	10.5	9.6
217	do	Borroloola	do	17.8	12.3	13.4	*69.1*	*89.3*	14.50		[5 13] 7.2	12.4		*58.1*	10.4	9.9
16111	N. M. M.		do	17.6	12.2	12.4	*69.3*	*83.2*	14.07	[2] 10.1	6.3	12.5	*80.8*	*50.4*	10.4	10
151	S. A. M. A.		do	17.3	12	12	*69.4*	*82.2*	13.77	[10] 9.6	6.4	12.7	*75.6*	*50.4*	10.6	9.8
189	do	Anson Bay	do	17	11.8	12.6	*69.4*	*87.5*	13.80	[9] 10.7	6.6	[5] 12.6	*84.9*	*52.4*	10.4	9.8
16381	N. M. M.		do	17	11.8	12.7	*69.4*	*88.2*	13.83	[4] 10.2	6.3	12	*85*	*52.5*	10	9.5
68	S. A. M. A.	Port Darwin	do	17.5	12.2	13.2	*69.7*	*89.2*	14.30	[11] 10.4	6.4	13	*80*	*49.2*	10.8	10.3
409	do	Arnhem Bay	do	17.8	12.4	13.1	*69.7*	*86.8*	14.43	[7] 9.8	6.4	12.3	*79.7*	*52*	10.8	10
198	do	Anson Bay	do	17.2	12	13	*69.8*	*89*	14.07		6	12.4		*48.4*	9.9	9.8
17088	N. M. M.		do	17.2	12		*69.8*			[4] 10.1	5.8	[5] 11.7	*86.3*	*49.6*		
17086	do		do	17.3	12.1	13	*69.9*	*88.4*	14.13	[7] 10.7	6.7	11.7	*91.4*	*57.3*	10	9.8
[a] 16113	do		do	18	12.6	13	*70*	*85*	14.53	[2] 11	7.1	12.8	*85.9*	*55.5*	11	10.3
147	S. A. M. A.		do	17.4	12.2	[1] (12.5)	*70.1*	*(84.5)*	(14.03)	[10] 9.7	6.3	11.9	*81.5*	*52.9*		
71	do	Port Darwin	do	17.6	12.4	13.2	*70.4*	*88*	14.40	[4] 10.5	6.5	12.1	*86.8*	*53.7*	10.6	9.8
206	do	Anson Bay	do	17.3	12.2	13.4	*70.5*	*90.5*	14.30		6.2	11.9		*52.1*	10.2	10
148	do		do	17.4	12.3	13.1	*70.7*	*88.5*	14.27	[3] 9.6	5.9	12.1	*79.3*	*48.8*	10.4	9.8
A5115	A. M. S.	Melville Island	do	16.8	11.9	12.9	*70.8*	*89.6*	13.87		6	[5] 12		*50*	9.9	9.3
16375	N. M. M.		do	17.8	12.6	13.2	*70.8*	*86.8*	14.53		6.9	12.9		*53.5*	11.1	10.1
15959	do	Hasan River	do	17.8	12.6	13.3	*70.8*	*87.5*	14.57		(17)					9.9

[4] 153			do.	18.2	12.9	13.4	*70.9*	*85.9*	14.83	[2] 11.4	7.2	[8] 13.3	*85.7*	*54.1*	10.1	10.2
379	do.	Melville Island	do.	17.5	12.4	13	*70.9*	*86.7*	14.30	[9] 9.6	5.8				9.6	10
179	do.	Anson Bay	do.	17	12.1	12.8	*71.2*	*87.7*	13.97	[4] 11.3	6.7	[8] 12.2	*92.6*	*54.9*	9.7	9.5
76	do.		Adolescent	17.4	12.4	12.4	*71.3*	*83.2*	14.07		6.1	11.9		*51.3*	9.6	9.4
• 11448	do.		Adult	18.2	13	13	*71.4*	*83.3*	14.73	[2] 11.1	7.2	12.7	*87.4*	*56.7*	10	9.5
228	do.	Melville Island	do.	16.5	11.8	12.1	*71.5*	*85.2*	13.47	[2] 10.2	6.4	[1] 12.3	*82.9*	*52*	9.9	9.2
16130	N. M. M.	Port Darwin	do.	17.6	12.6	13.2	*71.6*	*87.4*	14.47	[2] 9.1	5.6	12.2	*74.6*	*45.9*	9.5	9.5
146	S. A. M. A.		do.	18	12.9	13.4	*71.7*	*87*	14.77		([13])					9.6
212	do.	Borroloola	do.	17.4	12.5	13.1	*71.8*	*87.3*	14.33		[1] (6.5)	12.8		*(50.8)*		9.8
16128	N. M. M.		do.	17.2	12.4	13.3	*72.1*	*89.9*	14.30		[5] 6.5	12.6		*51.6*	[5] 10.4	9.5
73	S. A. M. A.	Near Southport	do.	17.6	12.7	13.8	*72.2*	*90.8*	14.70	[2] 10.9	6.8	12.6	*86.5*	*54*	10.4	9.9
16107	N. M. M.		do.	16.9	12.2	12.5	*72.2*	*85.6*	13.87	[4] 10.1	6.5	12	*84.2*	*54.2*	9.9	9.6
16365	do.		do.	17	12.3	13.1	*72.4*	*89.7*	14.13	[27] 10.3	6.6	12.3	*83.7*	*53.7*	10.2	9.6
16118	do.		do.	17.4	12.6	12.5	*72.4*	*83.3*	14.17	[2] 9.4	[17] 5.9	12.2	*77*	*48.4*	10.6	9.2
187	S. A. M. A.	Anson Bay	do.	17.1	12.4	13.6	*72.5*	*91.9*	14.37	[9] 10.3	6.2	11.7	*88*	*53*	10.1	10.1
200	do.	do.	do.	17.8	12.9	13	*72.5*	*84.4*	14.57	[2] 10.5	6.5	12.8	*82*	*50.8*	10.2	10
408	do.	Arnhem Bay	do.	16.5	12	13	*72.7*	*91.6*	13.83	[7] 10.1	6.4	12.4	*81.4*	*51.6*	10.1	9.5
16376	N. M. M.		do.	18.4	13.4	13	*72.8*	*81.8*	14.93		6.6				10.7	10.3
215	S. A. M. A.	Borroloola	do.	17.8	13	13	*73*	*84.4*	14.60		[5 8] 6.7	12.9		*51.9*	[1] 9.8	9.5
16360	N. M. M.		do.	17.8	13	13.2	*73*	*85.7*	14.67	[2] 10.2	6.4	12.8	*79.7*	*50*	10.2	9.9
16131	do.	Port Darwin	do.	17.8	13	13.4	*73*	*87*	14.73	[2] 10	6.6	12.8	*78.1*	*51.6*	10.4	9.9
442	S. A. M. A.	Melville Island	do.	17.9	13.1	13	*73.2*	*83.9*	14.67		[5 13] 6.7	12.8		*52.3*		9.9
18508	N. M. M.	Pine Creek	do.	17.2	12.6	13.7	*73.3*	*92*	14.50		6.7	11.8		*56.8*	10.2	9.6
16366	do.		do.	17.1	12.6	13.1	*73.7*	*88.5*	14.27	[2] 9.5	5.9	12.3	*77.2*	*48*	9.8	9.1
65	S. A. M. A.	Gulf of Carpentaria	do.	17.6	13	13.4	*73.9*	*87.6*	14.67	[11] 11.1	[5 13] 6.7	12.7	*87.4*	*52.8*	[5] 9.7	9.7
128	do.	Melville Island	do.	17.4	12.9	12.8	*74.1*	*84.2*	14.37	[7] 10.4	6.5	13.2	*78.8*	*49.2*	10.4	10
[f] 16124	N. M. M.		do.	17	12.6	12.3	*74.1*	*83.1*	13.97		6.7	[8] 12		*55.8*	10.2	9.9
15	S. A. M. A.	Near Southport	do.	16.7	12.4	13	*74.2*	*89*	14.03	10.6	6.7	11.7	*90.6*	*57.3*	9.8	9.5
16382	N. M. M.		do.	17.1	12.7	12.6	*74.3*	*84.6*	14.13	[2] 10.5	6.9				10.6	9.9
173	S. A. M. A.		do.	17.6	13.1	12.6	*74.4*	*81.8*	14.43		6.5	12.7		*51.2*	8.9	8.9
16364	N. M. M.		do.	17.2	12.8	13.5	*74.4*	*90*	14.50		6.3	12.8		*49.2*	9.9	10

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 53.

NORTHERN TERRITORY CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior or maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
70	S. A. M. A.	Port Darwin	Adult	16.9	12.6	12.2	*74.6*	*82.4*	13.90	[10] 10	6.9				10.4	9.7
169	do		do	17.7	13.2	12.1	*74.6*	*78.6*	14.33	[11] 10.4	6.4				10.8	10
16363	N. M. M.		do	16.3	12.2	13	*74.8*	*91.6*	13.83	[2] 9.4	6	11.	*80.*	*5: 3*	9.8	9.6
16371	do		do	17.9	13.4	13.5	*74.9*	*86.5*	14.93	[9] 11.2	6.9	12.	*88.*	*54.3*	10.4	9.9
397	S. A. M. A.	Melville Island	do	16.9	12.7	12	*75.2*	*81.1*	13.87	[3] 9.2	5.8	12.	*72.*	*45.7*	9.7	9.2
13	do	Southport	Young, but all 3 molars erupted.	16.7	12.6	12.6	*75.4*	*86.3*	13.97	10.6	6.8	11.	*90.*	*58.1*	9.8	9.4
426	do	Melville Island	Adult	16.8	12.7	12.6	*75.6*	*85.1*	14.03	(21)	6	12		*50*	9.3	9.4
* 445	do	Burrundi	do	17.2	13	13.4	*75.6*	*88.7*	14.53	[9] 10.7	6.8	11.9	*89.9*	*57.1*	10.7	10
12	do	Pine Creek	do	16.3	12.4	12.7	*76.1*	*88.2*	13.80	11.2	6.7	12.4	*90.3*	*54*	10.3	9.6
145	do		do	17.6	13.4	13	*76.1*	*83.9*	14.67	[3] 10	6.4	12.3	*81.3*	*52*	10.2	9.8
199	do	Anson Bay	do	16.8	12.8	13	*76.2*	*87.8*	14.20	[3] 9.2	5.5	12.9	*71.3*	*42.6*	9.7	9.4
192	do	do	do	17	13.2	13	*77.6*	*86.1*	14.40	[7] 10	6.2	12.5	*80*	*49.6*	10.1	9.7
16129	N. M. M.	Port Darwin	do	16.5	12.8	13	*77.6*	*89*	14.10	[9] 10.3	6	11.9	*86.6*	*50.4*	10	9.6
204	S. A. M. A.	Anson Bay	do	16.3	12.7	12.1	*77.9*	*83.4*	13.70	[3] 10.7	6.7	12.6	*84.9*	*53.2*	10.1	9.8
Totals				(80) 1,397.2	(80) 998.3	(77) 995	(80)	(77)	(77)	(53) 545.6	(74) 478.4	(72) 891.1	(50)		(88) 902.5	sz.
Averages				*17.46*	*12.48*	*12.92*	*71.5*	*86.3*	*14.29*	*10.29*	*6.4*	*12.38*	*83.3*	*52.3*	*10.1*	*9.*
Minima				16.3	11.6	12	*64.1*	*78.6*	13.47	9.1	5.5	11.7	*71.3*	*42.6*	8.9	8.
Maxima				18.8	13.4	13.8	*77.9*	*92*	14.97	11.4	7.2	13.3	*92.6*	*58.1*	11.1	10.

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
					°	°										
197	S. A. M. A.	Anson Bay	Adult	9	68.5	54.5		3.2	3.65	*87.7*	[18] 4.6	2.5	*54.4*	5.9	6.3	*106.8*
227	do	Melville Island	do	9.3	71	51	3.3	3	3.5	*85.7*	[18] 4.8	2.35	*49*	5.9	6.3	*106.8*
443	do		do	9	71.5	50	([21])	3.48	3.95	*88.1*	4.6	2.7	*58.7*			
	Dr. Basedow's	Humbert River	do													
380	S. A. M. A.	Melville Island	do	8.7							4.4	2.75	*62.5*			
[a] 11411	do		do	9				3.15	3.8	*82.9*	4.7	2.9	*61.7*			
16119	N. M. M.		do	8.6	67	47.5	3	3.22	3.75	*85.9*	[18] 4.5	2.4	*53.3*	5.8	6.5	*112.1*
[a] 11452	S. A. M. A.	Melville Island	do	9	68.5	56	3.35	3.32	3.82	*86.9*	4.8	2.95	*61.5*	5.9	6.8	*115.2*
16109	N. M. M.		do	9	65	43	3.4	3.38	3.95	*85.6*	4.7	2.6	*55.3*	6	6.4	*106.7*
180	S. A. M. A.	Anson Bay	do	9			2.9	3.4	3.88	*87.6*						
190	do	do	do	9	70	63.5	2.8	3.08	3.75	*82.2*	4.45	2.7	*60.7*	5.5	6.5	*118.2*
201	do	do	do	9	62.5	44.5	3.3	3.35	3.5	*95.7*	4.5	2.45	*54.4*	6.1	6.2	*101.6*
144	do		do	9.3	70	45		3.2	3.85	*83.1*	[18] 4.7	2.5	*53.2*	5.8	6.2	*106.9*
16378	N. M. M.		do	9.1	66	40.5		3.55	3.95	*89.9*	4.6	2.6	*56.5*	6.6	6.7	*101.5*
17082	do		do	8.8				3.55	3.92	*90.6*	([h])					
[b] 213	S. A. M. A.	Borroloola	do	9.2	71	50.5		3.15	3.75	*84*	[18] 4.65	2.2	*47.3*	5.9	6.8	*115.2*
177	do	Anson Bay	do	9.1	64.5	41	2.9	3.6	3.98	*93.6*	4.45	2.55	*57.3*	6.1	6.3	*103.3*
217	do	Borroloola	do	8.9	66	47		3.28	3.78	*86.8*	4.9	2.5	*51*	6	6.6	*110*
16111	N. M. M.		do	9.2	68.5	42.5	3.1	3.32	3.72	*89.2*	4.8	2.5	*52.1*	5.8	6.4	*110.3*
151	S. A. M. A.		do	9.1	65	44.5		3.15	3.7	*85.1*	[18] 4.35	2.7	*62.1*	6.2	6.6	*106.4*
189	do	Anson Bay	do	9.4	66	53	2.95	3.3	3.58	*92.2*	[18] 4.8	2.7	*56.2*	6.2	6.9	*111.3*
16381	N. M. M.		do	8.8	67	51	2.95	3.2	3.78	*84.6*	4.25	2.2	*51.8*	5.9	6.8	*106.8*
68	S. A. M. A.	Port Darwin	do	9.6	68	48		3.22	3.78	*85.2*	4.6	2.6	*56.2*	6.4	6.7	*104.7*
409	do	Arnhem Bay	do	9.6	65.5	43	2.9	3.25	4.05	*80.2*	4.85	2.85	*58.8*	6	6.2	*103.3*
198	do	Anson Bay	do	8.9	71.5	48.5		3.05	3.8	*80.3*	[18] 4.55	2.6	*57.1*	5.5	5.6	*101.8*

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 53.

NORTHERN TERRITORY CRANIA—Continued

FEMALE—Continued

...tal N...	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°										
17	N. M. M.		Adult				2.8	3.35	3.52	*95.2*	[18] 4.6	2.[illegible]	*57.6*			
...uoo	do		do	8.8	69	51	3.1	3.25	3.9	*83.3*	4.7	2.5	*53.2*	5.	6.2	9
...113	do		do	9.8	65.5	55	3.4	3.4	3.75	*90.7*	[1] 4.75	2.7	*57.9*	6.	6.4	2
147	S. A. M. A.		do					3.08	3.55	*86.8*	4.35	2.7	*62.1*	5.	6.2	8
71	do	Port Darwin	do	9.2	65	48		3.08	3.92	*78.6*	4.35	2.5	*57.5*	6.	6.1	4
206	do	Anson Bay	do	9.2	70.5	51		3.3	3.75	*88*	[18] 4.65	2.6	*55.9*	5.	5.9	3
148	do		do	9.2	67.5	44		3.1	3.62	*85.6*	4.3	2.5	*58.1*	5.	6.3	8
...115	A. M. S.	Melville Island	do	8.6	66.5	46.5		3.12	3.8	*82.1*	[18] 4.1	2.4	*58.5*	5.	6	7
...375	N. M. M.		do	9.6	63.5	47		[20] 3.1	[20] 3.8	*81.6*	4.6	2.7	*59.8*	6.	6.2	9
...959	do	Hasan River	do	8.8				3.35	3.85	*87*	5	2.8	*56*	5.	6	1
153	S. A. M. A.		do	8.8	70	51	3.1	[20] 3.4	[20] 3.8	*89.5*	[16] 5	2.8	*57*	6	6.5	3
379	do	Melville Island	do	9	77	63	2.6	3.15	3.7	*85.1*	4.35	2.4	*56.*	5.	6.1	6
179	do	Anson Bay	do	8.2	68		3.4	3.4	3.62	*93.9*				5.	6.8	9
76	do		Adolescent	8.7	69.5	53		3.18	3.58	*88.8*	4.55	2.5	*55*	(5.	6.6	(1...
...448	do		Adult	8.6	65	49	3.45	3.38	3.8	*88.9*	4.9	2.8	*57.*	6.	6.8	7
228	do	Melville Island	do	8.8	64.5	51	3.15	[19] 3.2	[19] 3.7	*86.5*	4.5	2.4	*53.*	5.	5.6	7
...130	N. M. M.	Port Darwin	do	8.6	73	52.5	2.75	3.18	3.72	*85.5*	[18] 4.05	2.55	*63*	5.	6.3	5
146	S. A. M. A.		do	8.6				3.25	3.65	*89*	[19] 4.95	2.55	*51.*			
212	do	Borroloola	do	8.8				3.45	3.85	*89.6*	[19] 4.7	2.4	*51.*			
...128	N. M. M.		do	9	64	48		3.4	3.78	*90*	[1] 4.3	2.6	*60.*	6.	6.3	'03.3
73	S. A. M. A.	Near Southport	do	8.8	67	41		3.2	3.85	*83.1*	4.65	2.5	*53.*	6.	6.5	'06.6
...107	N. M. M.		do	8.8	68.5	49	2.8	3.35	3.6	*93*	[18] 4.8	2.4	*50*	5.	6.2	'08.8
...365	do		do	9.1	66	54	3.2	3.15	3.5	*90*	4.5	2.5	*55.*	6	6.3	'05
...118	do		do	9.2	60.5	44.5	3	2.85	3.6	*79.2*	3.95	2.65	*67.*	6	6.5	'08.3
187	S. A. M. A.	Anson Bay	do	9	72	50.5	2.9	3.42	3.72	*91.9*	4.5	2.55	*56.*	5.8	6.6	'13.8
200	do	do	do	9	69.5	46.5	3.15	3.5	3.8	*92.1*	4.8	2.6	*54.*	5.8	6.6	'13.8
408	do	Arnhem Bay	do	8.8	66	47	3	3.55	3.9	*91*	4.45	2.55	*57.*	5.8	6.2	'06.9
...376	N. M. M.		do	9.3	68.5	40		3.18	3.8	*83.7*	5	2.6	*52*	6.2	6.4	'03.2
215	S. A. M. A.	Borroloola	do	8.5	67	49		3.38	3.78	*89.4*	4.6	2.4	*52.*	5.8	6.3	'08.6
...360	N. M. M.		do	9.1	69	47.5	3.2	3.38	3.7	*91.4*	4.8	2.9	*60.*	6.1	6.3	'03.3
...131	do	Port Darwin	do	9.2	67	43	2.95	3.48	3.9	*89.2*	5.1	2.75	*53.*	6	6 6	'10
442	S. A. M. A.	Melville Island	do	8.8				3.2	3.95	*81*	4 8	2.75	*57*			

18508	N. M. M.	Pine Creek	do	8.8	65.5	41		3.3	3.85	85.7	4.7	2.65	56.4	5.7	6.5	114
16366	do		do	8.7	65.5	46	2.8	3.25	3.55	91.6	4.3	2.6	60.5	5.4	5.8	107.4
65	S. A. M. A.	Gulf of Carpentaria	do	8.4	70	47.5		3.5	4.05	86.4	4.8	2.55	53.1	[l] 6.2	6.4	103.2
128	do	Melville Island	do	9.4	68	50		3.32	3.65	91	[18] 4.9	2.6	53.1	5.6	6.2	110.7
[f] 16124	N. M. M.		do	8.8	68.5	46		3.25	3.68	88.3	[18] 4.7	2.25	47.9	5.6	6.1	108.9
15	S. A. M. A.	Near Southport	do	8.1	67	40.5		3.4	3.95	86.1	4.65	2.4	51.6	5.9	6	101.7
16382	N. M. M.		do	9.3	65	51.5	3	3.38	[h] 3.8	88.9	[i] 4.6	2.7	58.7	6.1	6.7	109.8
173	S. A. M. A.		do	8	69	59		3.3	3.68	89.7	[18] 4.4	2.2	60	5.5	6	109.1
16364	N. M. M.		do	8.8	73	46		3.45	3.95	87.3	4.9	2.9	59.2	5.7	6.5	114
70	S. A. M. A.	Port Darwin	do	9	64.5	47		3.4	3.75	90.7	4.8	2.8	58.3	5.8	5.8	100
169	do		do	8.9	65.5	39	3.3	3.2	3.55	90.2	4.25	2.7	63.5	6	6.1	101.7
[e] 16363	N. M. M.		do	8.8	70	52	2.75	3.22	3.7	87	4.35	2.35	54	5.5	6.1	110.9
16371	do		do	9	66.5	45.5	3.25	3.58	3.85	93	4.95	2.55	51.5	6	6.4	106.7
397	S. A. M. A.	Melville Island	do	9	68	61.5	2.7	3.1	3.7	83.8	4.1	2.45	59.8	5.4	6.2	114.8
13	do	Southport	Young, but all 3 molars erupted.	8.5	66	49.5		3.45	3.8	90.8	4.7	2.3	48.9	[m] 5.8	6.4	110.3
426	do	Melville Island	Adult	8.4	72	51	2.75	3.32	3.75	88.5	4.55	2.55	56	5.3	6.3	118.9
[g] 445	do	Burrundi	do	9.3	65.5	48.5	3.2	3.5	3.7	94.6	4.6	2.75	59.8	5.9	6.2	106.1
12	do	Pine Creek	do	8.8	65	46		3.1	3.98	77.9	4.5	2.55	56.7	6	6.2	103.3
145	do		do	9	68	44.5		3.2	3.55	90.2	4.8	2.4	50	5.5	6	109.1
199	do	Anson Bay	do	8.6	70.5	40.5	2.9	2.98	3.72	80.1	4.25	2.75	64.7	5.7	6.6	115.8
192	do	do	do	8.9	68.5	49.5	2.95	3.1	3.6	86.1	4.35	2.55	58.6	5.8	6.5	112.1
16129	N. M. M.	Port Darwin	do	8.9	69	50	2.9	3.08	3.62	85.1	4.25	2.6	61.2	5.5	5.8	105.4
204	S. A. M. A.	Anson Bay	do	8.8	68	48	3.25	3.38	3.8	88.9	[18] 4.75	2.45	51.6	5.7	5.6	98.2
Totals				(77) 687.7	(68)	(66)	(41) 124.55	(78) 255.92	(78) 293.18	(78)	(78) 349.35	(78) 195.75	(78)	(80) 402.8	(79) 441.5	(80)
Averages				8.93	67.6	48	3.04	3.28	3.76	87.2	4.6	2.58	56.1	5.84	6.31	107
Minima				8	60.5	39	2.6	2.85	3.5	77.9	3.95	2.2	47.3	5.1	5.6	91
Maxima				9.8	77	63.5	3.45	3.6	4.05	95.7	5.1	2.95	67.1	6.6	6.9	12[illegible]

[a] Tall female.
[b] Looks somewhat "boyish," but probably female.
[c] Somewhat male-like, but female.
[d] Most probably female.
[e] Pelvis surely female.
[f] Mixed blood (?).
[g] Massive.
[h] Nasal bones abnormal; prominent intranasal shelves.
[i] Nasal wall thick, but outer line indistinct.
[j] Asymmetrical.
[k] Not fully developed.
[l] Moderate intranasal shelves.
[m] Teeth not shovel-shaped.

NOTE.—For footnotes to reference figures see p. 3.

VICTORIA CRANIA

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
• 13316	N. M. M.	Loddon	Adult	19	12.4	12.9	*65.3*	*82.2*	14.77		7.1	12.7		*55.9*	10.7	10.1
• 18505A	do	Koquga	do	19.2	12.6	13	*65.6*	*81.8*	14.93		6.5	13		*50*	11.3	10.1
14320	do	Yalca	do	18.2	12.2	12.5	*67*	*82.2*	14.30	[10] 11.9	7.5	12.7	*93.7*	*59.1*	9.9	9.7
39	A. L. M.		Near adult	18.1	12.2	12.3	*67.8*	*81.5*	14.17	[9] 10.1	6	11.7	*86.3*	*51.3*	9.2	9.1
69	do		Adult	18	12.2	13.2	*67.8*	*87.4*	14.47		6.2	12		*51.7*	10.1	9.7
18332A	N. M. M.	Lake Boga	do	18	12.2	13.4	*67.8*	*88.7*	14.53	[7] 10.2	6.5	12.6	*81*	*51.6*	10.5	10.5
13301	do	Lower Murray River	do	18.3	12.4	13.7	*67.8*	*89*	14.80	[7] 11.1	6.3	12.6	*88.1*	*50*	9.9	9.5
95	A. L. M.		do	18.7	12.8	12.6	*68.4*	*79.8*	14.70		7	12.8		*54.7*	10.2	10.1
18499	N. M. M.	Koondrook	do	18.4	12.6	12.9	*68.5*	*83.2*	14.63	[2] 10.8	6.8	12.5	*86.4*	*54.4*	10.1	10.4
15054	do	Warrnambaol	do	18.4	12.6	12.8	*68.5*	*82.6*	14.60		5.9	11.9		*49.6*	9.5	9.3
84	A. L. M.		do	18	12.4	13.2	*68.9*	*86.8*	14.53		7.1	[8] 11.9		*59.7*	10.4	9.9
16997	N. M. M.		do	18	12.4	12.9	*68.9*	*84.9*	14.43	[3] 9.6	6.3	12.2	*78.7*	*51.6*	10.7	10.2
12745	do	Modewarre	do	18.4	12.7	12.8	*69*	*82*	14.63	[10] 10.2	7	12.2	*83.6*	*57.4*	10	9.7
13312	do	Wimmera	do	18.4	12.7	13.2	*69*	*84.6*	14.77		6.4	12.6		*50.8*	10.5	9.9
28862	do	Gunbower Island	do	18.2	12.6	12.5	*69.2*	*81.2*	14.43		6.7	12.9		*51.9*	10.3	9.8
12963	do	Hamilton	do	17.6	12.2	12.2	*69.3*	*81.9*	14	[7] 10.2	6.2	[8] 11.8	*86.4*	*52.5*	10.3	9.8
13018A	do	Near Koondrook	do	18.6	12.9	13.2	*69.4*	*83.5*	14.90	[10] 10.1	6.8	12.6	*80.2*	*54*	10.6	9.9
• 72	A. L. M.		do	18.7	13	13.3	*69.5*	*84.2*	15	[9] 11.3	6.9	[8] 11.8	*95.8*	*58.5*	10	10.2
A10798	A. M. S.		do	18.2	12.7	12.8	*69.8*	*83.1*	14.57		6.4	12.8		*50*	10.6	9.9
96	A. L. M.		do	18	12.6	12.4	*70*	*81*	14.33		6.7				10.1	10
13308	N. M. M.	Wimmera	do	18	12.6	13	*70*	*85*	14.53	[2] 10.4	6.8	13.1	*79.4*	*51.9*	10.5	10.1
• 40	A. L. M.		do	18.5	13	12.9	*70.3*	*81.6*	14.80		6.7	[8] 12.8		*52.3*	10.3	9.8
• 18498	N. M. M.	Koondrook	do	18.7	13.2	13.8	*70.6*	*86.2*	15.23	[4] 9.8	5.8	12.8	*76.6*	*45.3*	10.3	9.7
31390	A. M. S.		do	18.1	12.8	11.3	*70.7*	*73.4*	14.07							9.2
12858A	N. M. M.	Near Kerang	do	18.1	12.8	12.8	*70.7*	*83.1*	14.57	[2] 10	6.5					

13	A. L. M.		do	18	12.8	12.4	*71.1*	*80.5*	14.40		6.7	12.9		*51.9*	10.3	9.9
15100	N. M. M.	Near Chatsworth	do	18	12.8	13	*71.1*	*84.4*	14.60	[10] 10.3	6.7	[5] 12.5	*82.4*	*53.6*	10.2	10.3
[a] 13311	do	Bream Creek	do	18.6	13.4	13.4	*72*	*83.8*	15.13	[4] 10.9	6.8	12.9	*84.5*	*52.7*	9.9	9.9
54	A. L. M.		do	18	13	13.2	*72.2*	*85.2*	14.73			13.3				10
13011A	N. M. M.	Near Koondrook	do	17.6	12.7	12.9	*72.2*	*84.9*	14.40	[9] 9.8	6.1	[5] 12.3	*79.7*	*49.6*	10.6	9.9
57	A. L. M.		do	18	13	12.7	*72.2*	*81.9*	14.57		7.1	12.6		*56.4*	10.4	10.1
13020	N. M. M.	Near Koondrook	do	17.6	12.7	12.9	*72.2*	*84.9*	14.40	[7] 10	5.9	12.5	*80*	*47.2*	9.4	9.6
A10800	A. M. S.		Elderly adult.	18.4	13.3	12.7	*72.3*	*80.4*	14.80							9.5
13299	N. M. M.	Loddon	Adult	18.4	13.3	12.2	*72.3*	*77.2*	14.63	[10] 9.6	[3] 6.4	12.9	*74.4*	*49.6*	9.8	9.5
16217	do	Near Ararat	do	17.9	13	13.4	*72.6*	*87*	14.77		6.5	12.9		*50.4*	9.8	10
13916A	do	Near Koondrook	do	18.3	13.3	12.2	*72.7*	*77.2*	14.60	[3] 9.9	6.1	[5] 12.8	*77.3*	*47.7*	9.6	8.9
37	A. L. M.		do	17.3	12.6	11.8	*72.8*	*78.7*	13.90		6.4				9.4	9.6
[a] 12928	N. M. M.	Frankston	do	18.6	13.6	13	*73.1*	*80.8*	15.07	[10] 10.9	7.1	13.4	*81.3*	*53*	10.8	10.4
41	A. L. M.		do	17.2	12.6	11.6	*73.3*	*77.8*	13.80		6.5	12.2		*53.3*	9.2	9.3
73	do		do	17.2	12.7	13	*73.8*	*86.7*	14.30	[9] 10.6	6.5	11.5	*92.2*	*56.5*	9.9	9.8
47	do		do	17.6	13	12.4	*73.9*	*81*	14.33		6.1	12.1		*50.4*	9.5	9.4
[a] 17749	N. M. M.	San Remo	do	18.4	13.6	13.2	*73.9*	*82.5*	15.07		6.8				10.8	10.7
12	A. L. M.		do	18.1	13.4	12.7	*74*	*80.4*	14.73		6.9	[5] 12.6		*54.8*	9.9	9.9
10	do		do	18	13.4	14	*74.4*	*89.2*	15.13		7	12.8		*54.7*	9.9	10.2
[b] 19	do		do	18.8	14	[c] 12.2	*74.5*	*74.4*	15		[6] 6.6	13		*50.8*	10.3	9.7
[d] 16210A	N. M. M.		do	18.4	13.7	13.2	*74.5*	*82.5*	15.10	[2] 11.7	7.6	13.4	*87.5*	*56.7*	10.6	10.3
12810	do	Near Donald	do	17.6	13.2	11.8	*75*	*76.6*	14.20	[3] 9.9	6.7	12.3	*80.5*	*54.5*	9.8	9.2
[a] 13302	do	Rudy Creek	do	17.8	13.4	13.6	*75.3*	*87.2*	14.93	[9] 11.1	6.6	13.6	*81.6*	*48.5*	10.1	10.2
15	A. L. M.		do	17.2	13.2	13	*76.7*	*85.5*	14.47		6.2	12.7		*48.8*	9.7	9.5
Totals				(49) 888.7	(49) 630.5	(49) 628.1	(49)	(49)	(49)	(24) 250.4	(46) 303.4	(44) 553.8	(24)	(43)	(48) 466.4	(49) 482.4
Averages				*18.14*	*12.87*	*12.82*	*71*	*82.7*	*14.61*	*10.43*	*6.6*	*12.59*	*83.1*	*52.5*	*10.14*	*9.84*
Minima				17.2	12.2	11.3	*65.3*	*73.4*	13.80	9.6	5.8	11.5	*74.4*	*45.3*	9.2	8.9
Maxima				19.2	14	14	*76.7*	*89.2*	15.23	11.9	7.6	13.6	*95.8*	*59.7*	11.3	10.7

NOTE.—For footnotes to reference figures see p. 3. For footnote to reference letters see p. 57.

VICTORIA CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion Subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b\times100}\right)$
					°	°										
[a] 13316	N. M. M.	Loddon	Adult	9	65.5	46		[19] 3.25	[19] 3.9	83.3	4.6	2.8	60.9	6.4	6.4	100
[a] 18505A	do	Koquga	do	9.6	62.5	42.5		3.15	3.9	80.8	[18] 4.2	2.9	69			
14320	do	Yalca	do	8.4	66.5	51	3.95	3.45	3.85	89.6	[18] 4.8	2.5	52.1	6	6.6	110
39	A. L. M.		Near adult	8.3	70	56.5	3	3.22	3.65	88.2	4.2	2.55	60.7	5.5	6.7	121.8
69	do		Adult	8.8	68.5	45		3.22	3.75	85.9	[18] 4.45	2.65	59.5	5.6	[5] 6.3	112.5
18332A	N. M. M.	Lake Boga	do	9.4	72	53.5	3	3.4	3.75	90.7	[18] 4.55	2.7	59.4	6.1	6.4	104.9
13301	do	Lower Murray River	do	8.8	68	54	3.35	3.18	3.5	90.8	[a] 4.25	2.6	60.7	5.7	6.3	110.5
95	A. L. M.		do	9	69.5	52.5		3.42	3.75	91.2	4.9	2.55	52	6.1	6.5	106.6
18499	N. M. M.	Koondrook	do	9	73	51.5	3.2	3.4	3.6	94.4	[18] 5	2.4	48	5.6	6.1	108.9
15954	do	Warrnambaol	do	8.4	70	50		3	3.45	87	4.15	2.4	57.8			
84	A. L. M.		do	9	66	50.5		3.55	3.75	94.7	4.7	2.65	56.4	6.2	6.3	101.6
16997	N. M. M.		do	9.6	68	54	3	3.25	3.8	85.5	4.25	2.6	61.2	6.1	6.5	106.6
12745	do	Modewarre	do	8.7	67	53.5	3.2	3.55	3.85	92.2	[18] 4.5	2.3	51.1	[5] 5.6	6	107.1
13312	do	Wimmera	do	9.2	67	48		3.35	3.9	85.9	4.4	2.7	61.4	6	6.9	115
28862	do	Gunbower Island	do	9.2	66.5	54		3.22	4	80.5	4.6	2.45	53.3	5.8	6.3	108.6
12963	do	Hamilton	do	9.1	68	51.5	3.2	3.2	3.65	87.7	[f] 4.15	2.75	66.3	5.8	6.4	110.3
13018A	do	Near Koondrook	do	9.3	65	53	[5] 3.3	3	3.7	81.1	4.3	2.45	57	6.1	6.2	101.6
[a] 72	A. L. M.		do	9	71.5	55	3.5	3.42	4	85.5	5	2.7	54	6.1	6.7	109.8
A10798	A. M. S.		do	9.2	66	45.5		3.7	4.05	91.4	[18] 4.45	2.55	57.3	5.9	6.4	108.5
96	A. L. M.		do	8.8	70	47.5		3.28	3.68	89.1	4.85	2.5	51.6	6	6.1	101.7
13308	N. M. M.	Wimmera	do	9	67.5	47.5	3.3	3.5	3.95	88.6	4.5	2.5	55.6	[5] 6.1	6.2	101.6
[a] 40	A. L. M.		do	8.7	67	40		[19] 3.4	[19] 3.95	86.1	4.8	2.6	54.2	6	7	116.7
[a] 18498	N. M. M.	Koondrook	do	9	67.5	42.5	2.95	2.95	3.65	80.8	[18] 4.15	2.7	65.1	5.9	6.6	111.9
81390	A. M. S.		do	8.6			2.9	3.35	3.7	90.5	[18] 4.55	2.35	51.7	5.6	6.4	114.3
12858A	N. M. M.	Near Kerang	do	9.1	67.5	42	2.8	3.25	4	81.2	4.7	2.8	59.6	6.2	6.7	108.1

13	A. L. M.		do.	9.1	67.5	52		3.22	3.85		4.6	2.65	*57.6*	6	6.9	*'5*
15109	N. M. M.	Near Chatsworth	do.	8.8	72	44.5	3.4	3.45	3.7		4.9	2.65	*54.1*	5.7	6.3	*'0.5*
[a] 13311	do.	Bream Creek	do.	9.2	70	66	3	3.32	3.72		4.6	2.6	*56.5*	5.6	6.5	*'6.1*
54	A. L. M.		do.	9.2				3.35	4		4.4	2.6	*59.1*			
13011A	N. M. M.	Near Koondrook	do.	9.3	66.5	41.5	2.8	3.2	3.75		4.5	2.7	*60*	5.8	6.2	
57	A. L. M.		do.	9	67.5	51.5		3.2	3.8		4.65	2.7	*58.1*	5.9	6.6	
13020	N. M. M.	Near Koondrook	do.	8.4	74	46 5	2.95	3.42	3.75		4.5	2.3	*51.1*	5.4	6.1	
A10800	A. M. S.		Elderly adult.	8.4				3.7	3.55		[18] 4.7	2.55	*54.2*			
13299	N. M. M.	Loddon	Adult	8.8	68.5	50	2.9	3.5	3.8	*'2.*	4.8	2.7	*56.2*	5.8	6.3	*'08.6*
16217	do.	Near Ararat	do.	8.8	72.5	56		3.55	3.9	*91*	4.55	2.55	*56*	5.6	6.8	*'21.4*
13016A	do.	Near Koondrook	do.	8.2	64.5	43	2.9	2.9	3.8	*76.*	4.2	2.7	*64.3*	5.5	6	*'09.1*
[b] 37	A. L. M.		do.	8.4	72	52.5		3.3	3.5	*94.*	[f] 4.65	2.5	*53.8*	5.3	6.1	*'15.1*
[a] 12928	N. M. M.	Frankston	do.	9.4	67.5	51	3.3	3.25	3.75	*86.*	[18] 4.65	2.65	*57*	6.1	6.7	*'09.8*
41	A. L. M.		do.	8.2	70	49		3.4	3.8	*89.*	[18] 4.05	2.6	*52.5*	5.1	6	*'17.6*
73	do.		do.	8.6	70	46.5	3.2	3.3	3.58	*92.*	[18] 4.	2.55	*54.2*	5.9	6.4	*'08.5*
47	do.		do.	8.4	70.5	50.5		3.45	3.75	*92*	[18] 4.	2.35	*54*	5.2	5.9	*'13.5*
[a] 17749	N. M. M.	San Remo	do.	9.6	71			3.5	[19] 3.9	*89.*						
12	A. L. M.		do.	8.8	69.5	54.5		3.42	3.78	*90.*	4.8	2.5	*52.1*	5.8	6.4	*'10.3*
10	do.		do.	8.8	72	54		3.45	3.7	*93.*	5.05	2.65	*52.5*	5.5	6.1	*'10.9*
[b] 19	do.		do.	9.4	66	52.5		3.18	3.65	*87.*	5.05	2.65	*52.5*	5.9	6.5	*'10.2*
[d] 16210A	N. M. M.		do.	9.2	67	49.5	3.15	3.75	3.9	*96.*	5.3	2.55	*48.1*	6.2	6.2	*'00*
12810	do.	Near Donald	do.	8.4	64.5	47.5	2.9	3.52	3.82	*92.*	4.5	2.6	*57.8*	5.7	6.2	*'08.8*
[a] 13302	do.	Rudy Creek	do.	9.3	72	58	3.1	3.22	3.7	*87*	4.95	2.85	*57.6*	5.8	7	*'20.7*
15	A. L. M.		do.	8.6	69.5	55		3.4	3.55	*95.*	[illegible]	2.25	*56.2*	5.3	5.8	*'09.4*
Totals				(49) 436.5	(45)	(45)	(25) 78.25	(49) 163.61	(49) 184.73	(49)	(48) 220.35	(49) 124.05	(48)	(41) 235.5	(44) 281	(41)
Averages				*8.91*	*68.5*	*50*	*3.13*	*3.34*	*3.77*	*88.6*	*4.59*	*2.58*	[illegible]	*5.8*	*6.39*	*'10*
Minima				8.2	62.5	40	2.8	2.9	3.45	*76.3*	4	2.25		5.1	5.8	*'00*
Maxima				9.6	74	66	3.95	3.75	4.05	*96.2*	5.3	2.9		6.4	7	*'21.*

[a] (1) Surely female.
[b] (2) Full-blood; surely female.
[c] (a) Complete metopic suture.
[d] (b) Somewhat male-like, but malars, zygomae, mastoids, lower-jaw and parts of skeleton indicate female.
[e] (2) Moderate intranasal shelves.
[f] Asymmetrical

NOTE.—For footnotes to reference figures see p. 3.

NEW SOUTH WALES CRANIA

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
37	A. L. M.		Adult	18	12	13.7	66.7	91.3	14.57		6	12.6		47.6	10.1	9.5
12614	N. M. M.	Pooncarie	do	18.7	12.5	12.9	66.8	82.7	14.70		6.3	12.4		50.8	10.5	10.3
• 7	A. L. M.		do	18.9	12.8	12.4	67.7	78.5	14.70		7.3	13.1		55.7	11.1	10.1
621	A. L. S.	Port Jackson	do	18.2	12.4	13	68.1	85	14.53		6.4	[5] 12.5		51.2	10.2	10.2
8055	A. M. S.		do	17.7	12.1	12.3	68.4	82.6	14.03		6.6				10.6	10
1	A. L. M.		do	18.5	12.7	12.2	68.6	78.2	14.47		6.4	12.5		51.2	10.2	9.7
S1613	A. M. S.	Newcastle	do	18.2	12.5	13.1	68.7	85.1	14.60		5.8	12.2		47.5	9.4	9.1
S965	do	Darling River	do	18.6	12.8	12.9	68.8	82.2	14.77		(13)	12.7				9.8
A11775	do	Cobar	do	18	12.4	13.2	68.9	86.8	14.53	[3] 10.5	6.8	12.2	86.1	55.7	9.8	9.8
210	S. A. M. A.	Albemarle, Menindie	do	18	12.6	12.2	70	79.7	14.27		6.6	[5] 12.6		52.4	10.3	9.3
13	A. L. M.		do	18.5	13	12.8	70.3	81	14.77		7.1				10.5	10.2
890	A. L. S.		do	18.2	12.8	13.4	70.3	86.4	14.80	[7] 10.7	[8] 6.5	13	82.8	50	10.2	10.3
S1615	A. M. S.	Newcastle	do	17.6	12.4	12.6	70.4	84	14.20		6.4	12.3		52	10.2	9.8
38	A. L. M.		do	18	12.7	13.1	70.6	85.1	14.60			12.7			9.9	9.4
1179	A. M. S.	Mudgee	do	18	12.7	13.2	70.6	85.7	14.63		5.9	12.7		46.5	10	10
• 18497	N. M. M.		do	18	12.8	12.6	71.1	81.8	14.47	[3] 11	7	12.7	86.6	55.1	10.8	10.1
12724	do		do	18.2	13	12.6	71.4	80.8	14.60		5.6	11.6		48.3	9.4	9.1
A47	A. M. S.	Cowra	do	18.2	13	13.6	71.4	87.2	14.93	[4] 10.4	(13)	13.4	77.6			9.8
• 16995	N. M. M.	Deniliquin	do	19	13.6	12.8	71.6	78.5	15.13		6.8	13		52.3	10.1	9.3
431	S. A. M. A.	Moorna	do	18	12.9	12.1	71.7	78.6	14.33	[7] 11	6.9	12.6	87.3	54.8	10.6	9.6
28	A. L. M.		do	18	12.9	13.1	71.7	85.1	14.67	[3] 10.7	6.9	12.5	85.6	55.2	10.3	9.6
A11961	A. M. S.	Wellington Caves	do	17.2	12.4	12.4	72.1	83.8	14	[4] 9.5	5.8	12.2	77.9	47.5	9.4	9.3
• 25	A. L. M.		do	18.6	13.5	13.6	72.6	85	15.23		6.5	13.3		48.9	9.9	9.8
618	A. L. S.	Near Sydney	do	18.6	13.5	12.4	72.6	77.5	14.83		6.7	[5] 12.6		53.2	10.3	10
11963	A. M. S.	Yass district	do	17.9	13	13.2	72.6	85.7	14.70	[9] 10.8	6.7	11.6	93.1	57.8	10	10

S1614	do	Newcastle	do	17.6	12.8	13	72.7	85.5	14.47	----	6	12.3	----	48.8	9.8	9.8
[d] 1185	do		do	18.4	13.4	13.6	72.8	85.5	15.13	----	6.2	• 13.1	----	47.3	10.8	10.2
1196	do	Kiama	do	18	13.1	12.8	72.8	82	14.63	----	[3, 13] 6.3	12.6	----	50	----	9.8
[b] 36	A. L. M.		do	17.8	13	13	73	84.4	14.60	----	6.5	13.8	----	47.1	10.2	9.5
[f] A11776	A. M. S.	Cobar	Just adult	17.8	13	13.6	73	88.3	14.80	[9] 9.8	6.1	11.1	88.3	55	9.4	9.8
33	A. L. M.		Adult	18.2	13.3	13.2	73.1	84.1	14.90	----	6.4	13.1	----	48.8	10.1	9.8
B7065	A. M. S.	Cobar	do	18	13.2	13.1	73.3	84	14.77	[10] 9.9	[13] 6.5	12.5	79.2	52	10.5	9.9
S1616	do	Newcastle	do	17.7	13	12.9	73.4	83.8	14.53	----	6	11.9	----	50.4	10	9.4
39	S. A. M. A.	Wentworth	do	17.7	13.1	12.6	74	81.8	14.47	10.9	6.8	[5] 12.8	85.2	53.1	10.7	9.9
40	do	Tolarno	do	17	12.6	12.8	74.1	86.5	14.13	[4] 10.3	[5, 21] 6.5	12.1	85.1	53.7	[5] 9.6	9.5
1197	A. M. S.	Murumbidgee	do	17.7	13.2	13.4	74.6	87	14.77	----	[5, 11] 6.1	13	----	46.9	----	10.2
24	A. L. M.		do	18	13.5	13.5	75	85.4	15	[4] 10.6	(13)	12.7	83.5	----	----	9.5
[e] 1311	A. L. S.	Near Sydney	Near adult	17.3	13	13.1	75.1	86.2	14.47	[9] 11.1	[8] 6.8	12.1	91.7	56.2	10.1	10
S1157	A. M. S.	Jervis Bay	Adult	17	12.8	13	75.3	87.2	14.27	[2] 9.7	6	12.6	77	47.6	9.8	9.8
1201	do	do	do	18.3	14.1	13.4	77	82.7	15.27	----	[6, 40] 6.2	[5] 13.2	----	47	9.3	9.4
A11962	do	Yass District	do	17.4	13.4	13	77	84.4	14.60	[27] 9.9	6.3	12.2	81.2	51.6	8.8	9.4
1173	do		do	17.8	14	13	78.6	81.8	14.93	----	6.2	[5] 12.4	----	50	9.4	9.6
S1398	do	Cockle Creek	do	17	13.4	----	78.8	----	----	[9] 10.4	6.3	----	----	----	----	----
S1612	do	Newcastle	do	17	13.5	13.6	79.4	89.5	14.70	[4] 9.8	6.2	12.8	76.6	48.4	9.7	9.6
Totals				(44) 790.5	(44) 570.4	(43) 558	(44) ----	(43) ----	(42) ----	(18) 187	(40) 256.4	(41) 515.3	(17) ----	(37) ----	(38) 382	(40) 419.2
Averages				*17.96*	*12.96*	*12.98*	*72*	*83.9*	*14.64*	*10.39*	*6.41*	*12.57*	*83.7*	*51*	*10.05*	*9.75*
Minima				17	12	12.1	66.7	77.5	14	9.5	5.6	11.1	76.6	46.5	8.8	9.1
Maxima				19	14.1	13.7	79.4	91.3	15.27	11.1	7.3	13.8	93.1	57.8	11.1	10.3

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 61.

NEW SOUTH WALES CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°										
37	A. L. M.		Adult	8.8	67	44		3.55	3.85	92.2	4.3	2.5	58.1	5.8	6	103.4
12614	N. M. M.	Pooncarie	do	9.4	70.5	45.5		3.62	3.82	94.8	4.8	2.6	54.2	5.8	6.7	115.5
[a] 7	A. L. M.		do	9.4	63	45		3.2	3.7	86.5	4.8	3	62.5	6.3	6.6	104.8
621	A. L. S.	Port Jackson	do	9.2	72	51.5		3.18	3.8	83.7	4.8	2.55	53.1	6	6.4	106.7
8055	A. M. S.		do	9.4	66.5	59.5		3.05	3.72	82	[a] 3.5	[a] 2.4	68.6	6	6.6	110
1	A. L. M.		do	9.2	67	57		3	3.7	81.1	[18] 4.25	2.5	58.8	6.2	6.5	104.8
S1613	A. M. S.	Newcastle	do	8.4	69	50		3	3.5	85.7	4.2	2.3	54.8	5.3	6.6	124.5
S965	do	Darling River	do	8.6				3.45	3.75	92	4.85	2.85	58.8			
A11775	do	Cobar	do	8.8	70	58.5	3.3	3.2	3.85	83.1	4.6	2.6	56.5	5.8	6.6	113.8
210	S. A. M. A.	Albemarle, Menindie	do	8.8	62.5	43.5		2.9	3.7	78.4	4.55	2.8	61.5	6	6.3	105
13	A. L. M.		do	9.2	68	48.5		3.25	3.75	86.7	5.05	2.7	53.5	6.1	6.5	106.6
890	A. L. S.		do	9.4	72.5	58	2.9	3.2	3.85	83.1	4.85	2.6	53.6	5.7	6.5	114
S1615	A. M. S.	Newcastle	do	9	68	49.5		2.95	3.5	84.3	4.55	2.55	56	5.9	6.1	103.4
38	A. L. M.		do	9				3.32	3.75	88.5				[5] 5.9	6.7	113.6
1179	A. M. S.	Mudgee	do	9.2	73	53		3.1	3.55	87.3	4.5	2.8	62.2	5.5	6.7	121.8
[b] 18497	N. M. M.		do	9.6	65.5	52	3.35	3.05	3.7	82.4	4.95	2.9	58.6	6.2	6.6	106.4
12724	do		do	8.4	69.5	49.5		3	3.8	79	[18] 4.05	2.3	56.8	5.4	6	111.1
A47	A. M. S.	Cowra	do	8.8			3.4	3.4	3.9	87.2	4.7	2.5	53.2			
[c] 16995	N. M. M.	Deniliquin	do	8.6	63.5	46		3.1	3.75	82.7	[18] 4.6	2.7	58.7	5.9	7	118.6
431	S. A. M. A.	Moorna	do	9	62.5	44	3.4	3.52	3.85	91.4	[18] 4.65	2.75	59.1	6.4	6.9	107.8
28	A. L. M.		do	8.9	64.5	49	3.45	3.22	3.55	90.7	4.6	2.55	55.4	6.2	6.1	98.4
A11961	A. M. S.	Wellington Caves	do	8.2	71	48.5	2.75	3.12	3.7	84.3	4	2.4	60	5.3	6.2	117
25	A. L. M.		do	9	70	55.5		3.32	3.98	83.4	4.75	2.5	52.6	5.8	6.3	108.6
618	A. L. S.	Near Sydney	do	9	68.5	44		3.38	3.8	88.9	[j] 4.98	2.55	51.2	6.3	6.4	101.6
11963	A. M. S.	Yass District	do	8.8	70.5	52.5	3.3	3.18	3.7	85.9	4.6	2.6	56.5	5.8	6.7	115.5

S1614	do	Newcastle	do		72			3.2	3.65	87.7	[18] 4.2	2.3	54.8	5.7	6.2	108.5
[d] 1185	do		do	8.9	68	32		3.38	3.68	91.9	[18] 4.5	2.5	55.6	5.7	5.9	103.8
1196	do	Kiama	do	8.6				3.52	4.1	85.8	[h] 4.2	2.7	64.3			
[b] 36	A. L. M		do	9	65	49		3.3	3.85	85.7	[18] 4.6	3	66.2			
[f] A11776	A. M. S	Cobar	Just adult	8.8	75	61.5	2.7	3.12	3.5	89.1	[i] [18] 4.7	2.6	55.3	5	6.1	122
33	A. L. M		Adult	9	69	53		3.15	3.72	84.7	[18] 4.45	2.65	59.5	5.7	6.5	114
B7065	A. M. S	Cobar	do	9.2	66.5	43.5	3.2	3.35	3.7	90.5	4.8	3.2	66.7	6.3	6.3	100
S1616	do	Newcastle	do	8.8	67	45.5		2.95	3.7	79.7	4.3	2.65	61.6	5.8	6.4	110.3
39	S. A. M. A	Wentworth	do	9.2	64.5	46.5		[18] 3.2	[18] 3.7	86.5	4.55	2.7	59.4	6.2	6.9	111.3
40	do	Tolarno	do	8.6	69	54		3.75	3.9	96.2	4.65	2.8	60.2	[j] 5.6	6.4	114.3
1197	A. M. S	Murumbidgee	do	9.2				3.35	3.58	93.6	[k] 4.25	2.5	58.8	[j] 5.8	6.4	110.3
24	A. L. M		do	8.6			3.45	3.1	[i] 3.75	82.7	[m] 4.15	2.8	67.5	[j] 5.6	6.4	114.3
1311	A. L. S	Near Sydney	Near adult	9	70	51.5	3.3	3.45	3.75	92	5	2.45	49	5.9	6.2	105.1
S1157	A. M. S	Jervis Bay	Adult	8.6	72	44	.75	3.6	3.8	94.7	4.5	2.5	55.6	5.9	6.4	108.5
1201	do	do	do	8.5	71.5	51.5		3.45	3.8	90.8	[18] 4.9	2.6	53.5	5.5	6.4	116.4
A11962	do	Yass District	do	7.6	75	46.5	2.6	3.52	3.78	93.1	[18] 4.7	2.55	54.2	5.4	5.9	109.3
1173	do		do	8.6	73	62.5		2.9	3.5	82.9	[18] 4.05	2.35	58	5.2	5.9	113.5
S1308	do	Cockle Creek	do				3.1	[i] [18] 3.6	[i] [18] 3.8	94.7	4.45	2.75	61.8	6.1	6.6	108.2
S1612	do	Newcastle	do	8.6	70.5	52	2.7	3.2	3.55	90.2	4.[illegible]5	2.65	60.9	5.6	6.3	112.5
Totals				(42) 372.9	(30)	(30)	(18) 49.65	(44) 143.35	(44) 164.3	(44)	(43) 194.78	(43) 112.75	(43)	(40) 232.6	(40) 256.2	(40)
Averages				*8.88*	*69*	*50*	*3.1*	*3.26*	*3.73*	87.4	*4.53*	*2.62*	57.8	*5.82*	*6.4*	110
Minima				7.6	62.5	32	2.6	2.9	3.5	78.4	3.5	2.3	49	5	5.9	98.4
Maxima				9.6	75	62.5	3.45	3.75	4.1	96.2	5.05	3.2	68.6	6.4	7	124.5

[a] Looks somewhat male-like, but probably female.
[b] Surely female.
[c] Most signs indicate female and original note on skull says female.
[d] Mastoids and face female, but supraorbital ridges, zygomae, and muscular impressions male-like, yet probably female.
[e] Heavy.
[f] Possibly mixed blood.
[g] All upper incisors trace shovel-shaped.
[h] Very pronounced intranasal shelves.
[i] Inner nose.
[j] Right=4.85; Left=5.1.
[k] Asymmetrical.
[l] Nasal floor below anterior subnasal border.
[m] Moderate intranasal shelves.

NOTE.—For footnotes to reference figures see p. 3.

QUEENSLAND CRANIA

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
15225	A. M. S.	Mapoon	Adult	19	12	12.3	*63.2*	*79.4*	14.43	[10] 10.3	6.3	12.4	*83.1*	*50.8*	10.1	9.6
15226	do	do	do	18.8	12.2	12.9	*64.9*	*83.2*	14.63	[2] 9.8	[6] 6.2	12	*81.7*	*51.7*	9.9	9.7
15236	do	Carandotta	do	17.9	11.9	12.8	*66.5*	*85.9*	14.20	[4] 11.1	6.8	12.3	*90.2*	*55.3*	10.3	9.8
[a] 15205	do	Between Starcke and Jeannie Rivers.	do	19	12.7	13.1	*66.8*	*82.9*	14.93		[5, 6] 6.3	13		*48.5*	10.4	10.1
886	A. L. S.	Cape York Peninsula	do	17.2	11.6	12.2	*67.4*	*84.7*	13.67		6.3	[5] 12.1		*52.1*	10.3	9.7
[b] 1247	A. M. S.	Brisbane	do	18.6	12.6	13.7	*67.7*	*87.8*	14.97		([44])	12.2				9.5
[c] 15155	do	Roxburgh Downs	do	18.1	12.3	12.6	*68*	*82.9*	14.33	[4] 10.1	([13])	12.8				9.4
[d] 11444	S. A. M. A.	North Queensland	do	18.8	12.8	13.3	*68.1*	*84.2*	14.97		([35])	12.6				9.7
15204	A. M. S.	Between Starcke and Jeannie Rivers.	do	18.1	12.4	12.6	*68.5*	*82.9*	14.37		6.1	11.9		*51.3*	9.4	9.2
[b] 15227	do	Mapoon	do	18.8	12.9	12.8	*68.6*	*81*	14.83	[9] 11.5	[6] 7	12.9	*89.2*	*54.3*	10	9.4
[a] 15188	do	South Keppel Island	do	18.9	13	13	*68.8*	*81.2*	14.97	[2] 10.5	6.5	[5] 12.6	*83.3*	*51.6*	10.4	9.6
15220	do	Kuranda	do	18.6	12.8	12.4	*68.8*	*79*	14.60	[10] 9.6	5.9	11.8	*81.4*	*50*	9.6	9.5
15228	do	Normanton	do	17.6	12.2	13.6	*69.3*	*91.3*	14.47	[4] 9.8	6.2	11.6	*84.5*	*53.4*	9.8	9.4
[e] 15210	do	McIvor River	do	18.6	12.9	12.8	*69.4*	*81*	14.77	[7] 10.2	6.1	13.2	*77.3*	*46.2*	10	9.8
[f] 11412	S. A. M. A.	North Queensland	do	17.5	12.2	12.8	*69.7*	*86.5*	14.17	[7] 10.1	6.4	11.8	*85.6*	*54.2*	9.4	9.2
15160	A. M. S.	Walgra	do	17.5	12.2	12	*69.7*	*81.1*	13.90	([32])	6.2	12.3		*50.4*	10.2	9.5
15180	do		do	17.5	12.2	12.8	*69.7*	*86.5*	14.17	[3] 10.8	[3, 13] 6.7	12.4	*87.1*	*54*		9.4
B1765	do		do	17.8	12.4	12.9	*69.7*	*85.4*	14.37		6.2	12.4		*50*	10.3	9.9
15202	do	Mount Cook	do	17.3	12.1	12.2	*69.9*	*83*	13.87	[10] 9.6	6.5	12.1	*79.3*	*53.7*	10	9.4
15187	do	South Keppel Island	do	18	12.6	13.4	*70*	*87.6*	14.67	[3] 11.1	6.5	12.4	*89.5*	*52.4*	10.7	10.4
1228	do	Wide Bay	do	18.4	12.9	12.8	*70.1*	*82*	14.70		6.9	12.9		*53.5*	10.6	9.7
170	S. A. M. A.		do	18.5	13	12.6	*70.3*	*79.8*	14.70	10.7	6.4				10.4	10.5
1203	A. M. S.	Brisbane	do	17.6	12.4	12.8	*70.4*	*85.3*	14.27		6.2					9.3
15211	do	McIvor River	do	17.8	12.6	12.9	*70.8*	*84.9*	14.43	[7] 10.5	6.4	12.6	*83.3*	*50.8*	10.6	9.6
368	do	Russel River	do	17.8	12.6	13.4	*70.8*	*88.2*	14.60		6.5	13		*50*	10.7	10.2

12920	N. M. M.	North Keppel Island	do	18	12.8	12.6	71.1	81.8	14.47	[7] 9.8	5.8	12.2	80.3	47.5	9.9	9.8
15217	A. M. S.	Lower Mitchell River	do	17.3	12.3	13.9	71.1	93.9	14.50	[7] 10.1	[5, 13] 6.4	11.6	87.1	55.2		9.8
19827	N. M. M.	Isis Ford	do	18.4	13.1	12.1	71.2	76.6	14.53							9.6
15167	A. M. S.	South Keppel Island	do	17.7	12.6	12.9	71.2	84.9	14.40		6.7	[5] 12.7		52.8	10.6	10
15219	do	Kuranda	do	17.2	12.3	12.9	71.5	87.2	14.13	[7] 9.5	5.9	12.1	78.5	48.8	9.9	9.6
15233	do	Riversleigh	do	17.6	12.6		71.6			[4] 10.9	6.8	[5] 12.3	88.6	55.3		
15194	do	Mount Cook	do	17	12.2	12.9	71.8	88.4	14.03	[2] 10.3	6.8	12.4	83.1	54.8	9.2	9.6
[a] 15162	do		do	17.1	12.3	12.9	71.9	87.8	14.10	[3] 10.6	6.8	12.6	84.1	54	10.2	9.8
10505	do	Bellenden Ker	[h] Near adult	17.8	12.8	13.4	71.9	87.6	14.67	[9] 9.7	5.7	11.9	81.5	47.9	9.8	9.5
15182	do		Adult	17.5	12.6	13.4	72	89.3	14.50	[9] 10	6	12	83.8	50	10.2	10.2
7	A. L. M.		do	18	13	13.4	72.2	86.4	14.80		6	[5] 12.4		48.4	9.2	9.4
1241	A. M. S.	Cape York	do	17.9	13	13	72.6	84.4	14.63		6.6	[5] 12.2		54.1	10.1	9.7
367	do	Russel River	do	17.6	12.8	13	72.7	85.5	14.47		5.5	12.5		44	9.9	9.5
3241	do	Northwest Queensland	do	17.8	13	13.2	73	85.7	14.67							10.2
15191	do	Mirriam Vale	do	17.5	12.8	13.2	73.1	86.8	14.50	[7] 10.6	6.3	12.9	82.2	48.8	9.6	9.6
15238	do	Corandotta	do	17.9	13.1	12.4	73.2	80	14.47	[4] 10.2	[5, 13] 6.2	12.6	81	49.2		9.4
15197	do	Mount Cook	do	17.3	12.7	12.3	73.4	82	14.10		7				9.7	9.8
1236	do	Brisbane	Near adult	17.6	13.1	13	74.4	84.4	14.57		[4] 6.2	12.5		49.6	9.7	9.5
15232	do	Mackay	Adult	17.3	13	12.8	75.1	84.2	14.37	10.6	6.6	12.7	83.5	58	9.8	9.4
[b] 15200	do	Yeppoon	do	17.9	13.7	13.4	76.5	84.8	15	[4] 11.3	7.2	12.9	87.6	55.8	9.9	10.2
15179	do		do. [f]	16.9	13	13	76.9	86.7	14.30	[9] 10.9	6.3	12.2	89.3	51.6	9.2	9.6
15235	do	Corandotta	do	17.3	13.3	12.7	76.9	83	14.43	[4] 10.8	(13)	12.5	86.4			9.4
[k] 15158	do		do	16.5	12.7	13	77	89	14.07	[9] 10.4	[1] 6.5	12.1	86	53.7	10	9.3
15240	do	Corandotta	do	16.8	13	12.4	77.4	83.2	14.07	[2] 9.8	5.8	13	75.4	44.6	10.2	9.4
15196	do	Barron River	do	17.2	13.5	12.8	78.5	83.1	14.50	[9] 10.6	6.5	12.1	87.6	53.7	9.4	9.3
[m] 15229	do	Cape York	do	16.7	13.6	12.7	81.4	83.6	14.33		6.7	12.9		51.9	10.1	9.8
Totals				(51) 907.5	(51) 646.4	(50) 644	(51)	(50)	(50)	(32) 831.8	(45) 286.9	(46) 570.6	(31)	(42)	(40) 399.7	(50) 482.9
Averages				17.79	12.67	12.88	71.2	84.5	14.45	10.37	6.38	12.4	83.8	51.4	9.99	9.66
Minima				16.5	11.6	12	63.2	76.6	13.67	9.5	5.5	11.6	75.4	44	9.2	9.2
Maxima				19	13.7	13.9	81.4	93.9	15	11.5	7.2	13.2	90.8	55.8	10.7	10.5

NOTE.—For footnotes to reference figures see p. 3. For footnotes to reference letters see p. 65

QUEENSLAND CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion Subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b\times100}\right)$
					°	°										
15225	A. M. S.	Mapoon	Adult	8.8	67	42	2.8	3.45	3.85	*89.6*	4.7	2.6	*55.3*	6	6.7	*11.7*
15226	do	do	do	8.8	70	48	3	3.42	3.9	*87.7*	4.6	2.9	*63*	[b] 5.	5.9	*03.5*
15236	do	Carandotta	do	8.9	66.5	50.5	3.5	3.3	3.8	*86.8*	[18] 4.45	2.45	*55*	6	5.9	*98.3*
[a] 15205	do	Between Starcke and Jeannie Rivers.	do	9.2	69.5	48.5		3.05	3.75	*81.3*	[9] 4.5	2.5	*55.6*	5.	6.5	*14*
886	A. L. S.	Cape York Peninsula	do	9.2	66.5	47		2.85	3.45	*82.6*	4.7	2.85	*60.6*	5.	6.8	*16.2*
[b] 1247	A. M. S.	Brisbane	do	8.3				3.15	3.8	*82.9*	4.2	2.7	*64.3*			
[c] 15155	do	Roxburgh Downs	do	8.4			2.7	3.22	3.72	*86.6*	4.65	2.65	*57*	(5.	(5.9)	*07.3)*
[d] 11444	S. A. M. A.	North Queensland	do	9.1			[1] (3.4)	3.55	3.75	*94.7*	[18] 4.7	2.7	*57.4*			
15204	A. M. S.	Between Starcke and Jeannie Rivers.	do	8	69.5	45.5		2.98	3.65	*81.6*	4.15	2.35	*56.6*	5.		
[b] 15227	do	Mapoon	do	8.4	64.5	43	3.5	3.55	3.85	*92.2*	[18] 4.85	2.65	*54.6*	6		
[e] 15188	do	South Keppel Island	do	9	65	46.5	3.2	3.22	3.65	*88.2*	4.45	2.5	*56.2*	5.		
15220	do	Kuranda	do	8.4	71	40	2.9	3.4	3.85	*88.3*	[18] 4.5	2.45	*54.4*			
15228	do	Normanton	do	8.5	69	43.5	2.8	3.25	3.85	*84.4*	4.45	2.9	*65.2*	5.	6.	*16.1*
[e] 15210	do	McIvor River	do	8.8	70.5	47.5	3	3.5	3.7	*94.6*	4.35	2.65	*60.9*	5.	6.	*10.9*
[f] 11412	S. A. M. A.	North Queensland	do	8.2	68.5	50	2.8	3.48	3.62	*96.1*	[18] 4.4	2.6	*59.1*	5.	6.	*14.8*
15160	A. M. S.	Walgra	do	9.2	66	56	2.95	3.12	3.6	*86.7*	4.2	2.35	*56*	5.	6.	*05.1*
15180	do		do	8.4			3.3	3.32	3.7	*89.7*	[18] 4.6	2.45	*53.3*	6.	6.	*00*
B1765	do		do	9	69	44		3.12	3.72	*83.9*	4.5	2.8	*62.2*	6.	6.	*08.2*
15202	do	Mt. Cook	do	8.2	65.5	38.5	2.9	3.35	3.85	*87*	[18] 4.4	2.45	*55.7*	6.	6.	*03.3*
15187	do	South Keppel Island	do	9.6	70	53	3.4	3.25	3.68	*88.3*	4.6	2.6	*56.5*	5.	6.	*06.9*
1228	do	Wide Bay	do	9.4	63.5	54		3.1	3.8	*81.6*	4.6	2.7	*58.7*	5.	6.	*06.8*
170	S. A. M. A.		do	9.4	73	51	3	[20] 3.6	[20] 3.95	*91.1*	4.8	2.4	*50*	5.	6.	*05.1*
1203	A. M. S.	Brisbane	do	8.4				[20] 3.2	[20] 3.75	*85.3*	[c] 4.3	2.5	*58.1*			
15211	do	McIvor River	do	9.2	63.5	49	3.5	2.92	3.75	*77.9*	[c] 4.1	2.65	*64.6*	6.		*03.*
368	do	Russel River	do	9.6	68	51		3.28	3.75	*87.5*	4.7	2.8	*59.6*	5.		*12.*

12920	N. M. M.	North Keppel Island	do	8.8	72	50	3	3.15	3.5	90	[18] 4.15	2.2	53	5.2	5.6	107.7
15217	A. M. S.	Lower Mitchell River	do	8.5			2.8	3.32	3.5	94.8	4.6	2.5	54.4			
19827	N. M. M.	Isis Ford	do													
15167	A. M. S.	South Keppel Island	do	9.2	66.5	43.5		3.35	3.7	90.5	4.85	2.5	51.6	5.8	6.7	115.5
15219	do	Kuranda	do	9	69.5	56	2.8	3.15	3.7	85.1	4.15	2.55	61.4	5.7	5.9	103.5
15233	do	Riversleigh	do				3.1	3.3	3.6	91.7	4.7	2.35	50	5.9	6	101.7
15194	do	Mount Cook	do	8.2	72	56	2.9	3.42	3.9	87.7	[18] 4.8	2.6	54.2	5	5.9	118
[a] 15162	do		do	8.8	67	46	3.2	3.28	3.95	83	4.8	[r] 2.85	59.4	6.3	6.9	109.5
10506	do	Bellenden Ker	Near adult	8.7	70	48	2.6	3.05	3.6	84.7	[19] 4.2	2.35	56	5.4	6.5	120.4
15182	do		Adult	9.3	73	55.5	3.05	3.1	3.65	84.9	4.3	2.7	62.8	5.5	6	109.1
7	A. L. M		do	8.4	73.5	56		[20] 3.6	[20] 3.9	92.3	[18] 4.5	2.6	57.8	5.4	6.2	114.8
[e] 1241	A. M. S.	Cape York	do	8.8	67.5	49		3.15	3.6	87.5	4.55	2.55	56	5.7	6.2	108.8
367	do	Russel River	do	8.8	69.5	47.5		2.9	3.6	80.6	3.9	2.4	61.5	5.9	6	101.7
3241	do	Northwest Queensland	do					[19] 3.15	[19] 3.7	85.1						
15191	do	Mirriam Vale	do	8.3	71	47	2.9	3.28	3.65	89.9	4.4	2.8	63.6			
15238	do	Corandotta	do	8.6			3.2	2.95	3.85	76.6	4.2	2.7	64.3	[o] 5.9	6.3	106.8
15197	do	Mount Cook	do	8.4	70	50		3.4	3.75	90.7	[18] 4.85	2.7	55.7			
1236	do	Brisbane	Near adult	8.7	69.5	54.5		3.3	3.6	91.7	4.25	2.65	62.3	5.6	6.3	112.5
15232	do	Mackay	Adult	8.8	67	52.5	2.85	3.35	3.65	91.8	4.8	2.45	51	5.6	6.4	114.3
[b] 15200	do	Yeppoon	do	9	71.5	58	3.1	3.55	3.75	94.7	5.3	2.65	50	5.6	6.4	114.8
15179	do		do.[i]	8.3	74	56.5	3	3.15	3.7	85.1	[18] 4.5	2.45	54.4	5.5	6.4	116.4
15235	do	Corandotta	do	8.6			3.1	3.45	3.88	88.9	4.85	2.55	52.6			
[k] 15158	do		do	8.6	65	44	3.2	3.25	3.88	92.3	4.6	2.7	58.7	5.6	6.5	116.1
15240	do	Corandotta	do	8.8	65.5	35.5	3	3.15	4	78.8	[18] 4.35	2.7	62.1	6.1	6.7	109.8
15196	do	Barron River	do	8.2	69	48.5	2.75	3.25	3.72	87.4	[18] 4.6	2.6	56.5	6	6.3	105
[m] 15229	do	Cape York	do	9	68	52		3.12	3.58	87.2	4.8	2.4	50	5.9	6.1	103.4
				(48)	(46)	(46)	(33)	(50)	(50)	(50)	(49)	(49)	(49)	(40)	(40)	(40)
Totals				420.2			99.8	162.75	186.65		221.45	126.65		230.6	251.4	
Averages				*8.75*	*68.5*	*49*	*3.02*	*3.26*	*3.73*	*87.4*	*4.52*	*2.58*	*57.1*	*5.76*	*6.28*	*109*
Minima				8	63.5	35.5	2.6	2.85	3.45	76.6	3.9	2.2	50	5	5.6	98.3
Maxima				9.6	74	58	3.5	3.6	4	96.1	5.3	2.9	65.2	6.8	6.9	120.4

[a] Large female.
[b] Surely female.
[c] Supraorbital ridges male-like, but probably female.
[d] Whole skeleton; large female.
[e] Probably strong, young female.
[f] Tall strong male.
[g] Maikunduno tribe.
[h] Both upper third molars still in sockets; both lower third molars fully erupted.
[i] Supernumerary behind right upper median incisor.
[j] Third molars erupted—tiny; basal suture closed.
[k] Karunti tribe.
[l] Upper and lower posterior premolars missing.
[m] Marked "Tasmanina type of skull," and it is so. Occiput slightly asymmetrical; prominent parietal bossae.
[n] Possibly slight occipital compression.
[o] Upper third molars both diminutive.
[p] Decidedly thick intranasal shelves.
[q] Medium intranasal shelves.
[r] Marked intranasal shelves.

NOTE.—For footnotes to reference figures see p. 3.

WEST AUSTRALIAN CRANIA

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-NasionHeight (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
97	S. A. M. A.		Adult	17.8	12.1	13	*68*	*86.7*	14.30		6.3	12.2		*51.6*	9.5	9.4
[a] S1580	A. M. S.	Near Malcolm	do	18.6	12.7	13.5	*68.3*	*86.5*	14.93	[9] 10.7	6.5	12.7	*84.2*	*51.2*	10	10
[b] 171	S. A. M. A.		do	18.5	12.8	12.6	*69.2*	*80.8*	14.63		6.1	12.4		*49.2*	10.3	9.6
3	do	Murchison District	do	17.4	12.4	13	*71.3*	*87.2*	14.27	11	6.6	12.1	*90.9*	*54.6*	10.2	9.6
[c] 58	do		do	18.6	13.4	12.6	*72*	*73.8*	14.87	[4] 10.3	6.4	13.1	*78.6*	*48.8*	9.8	9.2
2	do	Geraldton	do	17.3	12.7	12.4	*73.4*	*82.7*	14.13		6.1	12.4		*49.2*	9.8	9.5
109	do	Bunbury	do	17.3	13.4	12.7	*77.5*	*82.5*	14.47		[11] 6.7	11.9		*56.3*	9.9	9.5
Totals				(7) 125.5	(7) 89.5	(7) 89.8	(7)	(7)	(7)	(2) 32	(7) 44.7	(7) 86.8	(2)	(7)	(7) 69.5	(7) 66.8
Averages				*17.93*	*12.78*	*12.83*	*71.3*	*84.2*	*14.51*	*10.67*	*6.38*	*12.4*	*84.4*	*51.4*	*9.93*	*9.54*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle °	Alv. Angle °	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim.(b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
97	S. A. M. A.		Adult	8.3	70	44		3.25	3.7	*87.8*	[13] 4.7	2.7	*57.4*	5.5	6.3	*114.6*
[a] S1580	A. M. S.	Near Malcolm	do	8.8	71	51	3.3	3.35	3.75	*89.3*	4.6	2.8	*60.9*	6	6.8	*113.3*
[b] 171	S. A. M. A.		do	9.1	66.5	49.5		[20] 3.05	[20] 3.8	*80.3*	4.2	2.35	*56*	5.8	6.2	*106.9*
3	do	Murchison District	do	8.7	65.5	44.5		3.4	4.05	*84*	4.55	2.55	*56*	6.4	6.4	*100*
[c] 58	do		do	8.4	65.5	45		3.15	3.82	*82.4*	4.4	2.8	*63.6*	5.8	6.2	*106.9*
2	do	Geraldton	do	8.6	69	48		3.4	3.85	*88.3*	4.3	2.6	*60.5*	5.8	6.7	*115.5*
109	do	Bunbury	do	8.9	67	54		3.28	3.85	*85.2*	4.8	2.35	*49*	5.7	[5] 6.1	*107*
Totals				(7) 60.8	(7)	(7)	(7)	(7) 22.88	(7) 26.82	(7)	(7) 31.55	(7) 18.15	(7)	(7) 41	(7) 44.7	(7)
Averages				*8.68*	68	*47.5*		*3.27*	*3.83*	*85.4*	*4.51*	*2.59*	*57.4*	*5.86*	*6.38*	*108.9*

[a] Large female. [b] Everything indicates a female. [c] Massive; parietal=6-7 mm. NOTE.—For footnotes to reference figures see p. 3.

NORTHWEST AUSTRALIAN CRANIA

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-NasionHeight (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
223	S. A. M. A.		Adult	17.2	12	12.8	*69.8*	*87.7*	14	[9] 10.3	[5] 6.7	11.7	*88*	*57.3*		9.5
	Dr. Basedow's	King Leopold Range	do	18.4	13	13	*70.6*	*88.8*	14.80		6.4	12.4		*51.6*	10	9.8
17	A. L. A.	Derby	do	16.8	12.6	12.9	*75*	*87.8*	14.10		(5)	13.4				
Totals				(3) 52.4	(3) 37.6	(3) 38.7	(3)	(3)	(3)		(2) 13.1	(3) 37.5		(2)		(2) 19.3
Averages				*17.47*	*12.53*	*12.9*	*71.7*	*88*	*14.30*		*6.55*	*12.5*		*54.4*		*9.65*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
223	S. A. M. A.		Adult	8.6	*	*		3.45	3.85	*89.6*	[13] 4.8	2.3	*47.9*			
	Dr. Basedow's	King Leopold Range	do	8.9	69.5	43.5		3.3	3.75	*88*	5	2.55	*51*	5.6	6.4	*114.3*
17	A. L. A.	Derby	do	9				3.55	3.75	*94.7*	(*)	2.7				
Totals				(3) 26.5				(3) 10.3	(3) 11.35	(3)	(2) 9.8	(3) 7.55	(2)			
Averages				*8.83*				*3.43*	*3.78*	*90.7*	*4.9*	*2.52*	*49.5*			

* Nasal bones anomalous.

NOTE.—For footnotes to reference figures, see p. 13.

CENTRAL AUSTRALIAN CRANIA

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-NasionHeight (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
(•)	Dr. Basedow's	Flinder's Ranges	Adult	19.2	12.7	12.1	*66.2*	*75.6*	14.67	9.9	6.2	12.5	*79.2*	*49.6*	10.3	10.1
	do	Mt. Hopelen	do	18.5	12.8	12.6	*69.2*	*80.8*	14.63	[10] 10	([13])	12.5	*80*			9.8
Totals				(2) 37.7	(2) 25.5	(2) 24.7	(2)	(2)	(2)	(2) 19.9		(2) 25	(2)			(2) 19.9
Averages				*18.85*	*12.75*	*12.35*	*67.6*	*78.2*	*14.65*	*9.95*		*12.5*	*79.6*			*9.95*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
(•)	Dr. Basedow's	Flinder's Ranges	Adult	9.3	70.5°	51.5°	2.9	2.9	3.65	*79.5*	4.6	2.6	*56.5*	5.9	6.5	*110.2*
	do	Mt. Hopelen	do	8.2			2.9	3.55	3.9	*91*	[18] 4.7	2.6	*55.3*			
Totals				(2) 17.5			(2) 5.8	(2) 6.45	(2) 7.55	(2)	(2) 9.3	(2) 5.2	(2)			
Averages				*8.75*			*2.9*	*3.22*	*3.78*	*85.2*	*4.65*	*2.6*	*55.9*			

• Whole skeleton; surely female.

NOTE.—For footnotes to reference figures see p. 3.

AUSTRALIAN CRANIA. (LOCALITY UNKNOWN)

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
53	S. A. M. A.		Adult	18.4	12.8	13	*69.6*	*83.3*	14.73		6.8	11.8		*57.6*	10	9.7
111	do		do	18.3	12.8	12.4	*70*	*79.5*	14.50		6.4	12.8		*50*	10.5	10.2
12923	N. M. M.		do	17.4	12.4	13.1	*71.3*	*87.9*	14.30		6.1	12		*50.8*	9.8	9.4
Totals				(3) 54.1	(3) 38	(3) 38.5	(3)	(3)	(3)		(3) 19.3	(3) 36.6		(3)	(3) 30.3	(3) 29.3
Averages				*18.03*	*12.67*	*12.83*	*70.3*	*83.6*	*14.51*		*6.43*	*12.2*		*52.7*	*10.1*	*9.77*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
53	S. A. M. A.		Adult	8.8	67.5	50.5		3.42	3.65	*93.7*	4.8	2.6	*54.2*	5.6	5.8	*103.6*
111	do		do	9.4	69.5	53		3.25	3.8	*85.5*	[18] 4.4	2.5	*56.8*	5.8	6.3	*108.6*
12923	N. M. M.		do	8.8	68	53		3.08	3.65	*84.4*	* 4.3	2.7	*62.8*	5.7	6.2	*108.8*
Totals				(3) 27	(3)	(3)		(3) 9.75	(3) 11.1	(3)	(3) 13.5	(3) 7.8	(3)	(3) 17.1	(3) 18.3	(3)
Averages				*9*	*68.5*	*52.5*		*3.25*	*3.7*	*87.8*	*4.5*	*2.6*	*57.8*	*5.7*	*6.1*	*107*

* Asymmetrical.

NOTE.—For footnotes to reference figures see p. 3.

ABSTRACT: AUSTRALIAN CRANIA

MALE

		Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-NasionHeight (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
South Australia (198)	Totals	(198) 3,779.1	(197) 2,621.3	(186) 2,431.9	(197)	(186)	(186)	(101) 1,156.4	(169) 1,175.9	(161) 2,182.7	(97)	(167)	(156) 1,670.5	(170) 1,868.3
	Means	*19.09*	*13.31*	*13.07*	*69.7*	*80.7*	*15.15*	*11.45*	*6.96*	*13.56*	*84.3*	*51.2*	*10.71*	*10.96*
Northern Territory (108)	Totals	(103) 1,910.3	(103) 1,328.9	(101) 1,365.6	(100)	(101)	(101)	(78) 877.2	(95) 655.4	(101) 1,365.8	(77)	(95)	(91) 968.4	(105) 1,086.6
	Means	*18.55*	*12.9*	*13.52*	*69.6*	*86*	*14.99*	*11.25*	*6.9*	*13.52*	*83.2*	*51*	*10.64*	*10.35*
Victoria (74)	Totals	(74) 1,412.2	(74) 994.9	(72) 984.8	(74)	(72)	(72)	(38) 430.1	(68) 483.2	(69) 957.9	(67)	(68)	(65) 703	(72) 752.7
	Means	*19.08*	*13.44*	*13.68*	*70.4*	*84.1*	*15.40*	*11.32*	*7.11*	*13.88*	*82.3*	*51.2*	*10.82*	*10.45*
New South Wales (59)	Totals	(59) 1,121.1	(59) 783.2	(53) 713.3	(53)	(53)	(53)	(29) 332.6	(50) 348.6	(42) 565	(30)	(50)	(44) 465.5	(53) 545.6
	Means	*19*	*13.27*	*13.46*	*69.9*	*83.4*	*15.25*	*11.47*	*6.97*	*13.45*	*85.2*	*51.4*	*10.58*	*10.29*
Queensland (52)	Totals	(49) 914.7	(49) 643.2	(49) 667.4	(49)	(49)	(49)	(32) 362.2	(42) 287.5	(44) 592.3	(31)	(46)	(42) 437.4	(52) 531
	Means	*18.67*	*13.13*	*13.62*	*70.3*	*85.7*	*15.14*	*11.32*	*6.84*	*13.46*	*84.8*	*50.9*	*10.41*	*10.21*
West Australia (10)	Totals	(10) 186	(10) 132.5	(10) 131.9	(10)	(10)	(10)	(5) 57.3	(7) 49.8	(9) 122.1	(5)	(7)	(7) 73.7	(10) 102.1
	Means	*18.60*	*13.25*	*13.19*	*71.2*	*82.8*	*15.01*	*11.46*	*7.11*	*13.57*	*86.4*	*52.3*	*10.53*	*10.21*
Northwest Australia (7)	Totals	(7) 131.9	(7) 90.7	(7) 92.9	(7)	(7)	(7)	(2) 24.2	(4) 28.8	(7) 94.3	(5)	(4)	(3) 31.7	(7) 71.8
	Means	*18.84*	*12.96*	*13.27*	*68.8*	*83.5*	*15.02*	*12.1*	*7.2*	*13.47*	*90.6*	*54.6*	*10.57*	*10.26*

Central Australia (6)	Totals	(6) 113.4	(6) 81.1	(6) 78.5	(6)	(6)	(6)	(4) 45.6	(5) 34.3	(5) 68.1	(4)	(5)	(5) 52.8	(6) 61.1
	Means	*18.90*	*13.52*	*13.08*	*71.5*	*80.7*	*15.17*	*11.4*	*6.86*	*13.62*	*83.1*	*50.4*	*10.56*	*10.18*
Locality unknown (7)	Totals	(7) 133.4	(7) 91.9	(7) 94.4	(7)	(7)	(7)	(3) 34.5	(7) 49.1	(7) 92.8	(5)	(7)	(7) 74.9	(7) 71.8
	Means	*19.06*	*13.13*	*13.49*	*68.9*	*83.8*	*15.23*	*11.5*	*7.01*	*13.26*	*87.8*	*52.9*	*10.7*	*10.26*
(521) Grand totals		(513) 9,702.1	(512) 6,767.7	(491) 6,560.7	(318)	(401)	(491)	(292) 3,320.1	(447) 3,112.6	(445) 6,041	(385)	(414)	(420) 4,477.9	(494) 5,091
Averages		*18.91*	*13.22*	*13.36*	*69.9*	*83.2*	*15.16*	*11.37*	*6.96*	*13.58*	*84*	*51.2*	*10.66*	*10.30*
Minima		17.3	11.6	11.6	*59.7*	*69.9*	14.20	9.4	5.7	12	*68.6*	*41.3*	9.2	9.2
Maxima		21.6	14.6	15	*77.9*	*94.7*	16.27	13.7	8.6	15	*102.2*	*62.4*	12.3	11.5

ABSTRACT: AUSTRALIAN CRANIA—Continued

MALE—Continued

		Basion subnasal Pt.	*Facial Angle*	*Alv. Angle*	Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
			°	°										
South Australia (198)	Totals	(166) 1,565.4	(180)	(180)	(92) 316.5	(178) 589.22	(178) 680.38	(178)	(176) 854.45	(176) 469.6	(176)	(157) 981.9	(157) 1,072.25	(157)
	Means	*9.43*	*67*	*50*	*3.44*	*3.35*	*3.86*	*86.8*	*4.85*	*2.67*	*55*	*6.25*	*6.83*	*109.3*
Northern Territory (108)	Totals	(101) 954.1	(90)	(90)	(54) 180.1	(107) 355.28	(107) 417.89	(107)	(106) 519.3	(106) 290.5	(106)	(95) 584.7	(96) 645.45	(95)
	Means	*9.45*	*68.5*	*51*	*3.34*	*3.32*	*3.9*	*85.1*	*4.9*	*2.74*	*55.9*	*6.15*	*6.72*	*109.3*
Victoria (74)	Totals	(71) 680.6	(64)	(64)	(43) 153.25	(72) 239.08	(72) 282.43	(72)	(72) 351.45	(72) 200.65	(72)	(65) 405.9	(65) 449.3	(65)
	Means	*9.59*	*67.5*	*52.5*	*3.56*	*3.32*	*3.92*	*84.7*	*4.88*	*2.79*	*57.2*	*6.24*	*6.91*	*110.8*
New South Wales (59)	Totals	(51) 475	(44)	(44)	(27) 95.2	(55) 182.8	(55) 214.28	(55)	(56) 273.9	(56) 156.5	(56)	(44) 274	(44) 304.3	(44)
	Means	*9.31*	*68*	*50*	*3.53*	*3.32*	*3.9*	*85.1*	*4.89*	*2.79*	*57.1*	*6.23*	*6.92*	*111.1*
Queensland (52)	Totals	(49) 450.8	(41)	(41)	(33) 110.75	(51) 170.69	(51) 197.36	(51)	(49) 238.2	(49) 134.55	(49)	(41) 245.8	(41) 277.95	(41)
	Means	*9.2*	*69*	*50*	*3.36*	*3.35*	*3.87*	*86.6*	*4.86*	*2.75*	*56.6*	*6*	*6.78*	*113*
West Australia (10)	Totals	(10) 92.3	(7)	(7)	(2) 7.1	(10) 34.5	(10) 39.88	(10)	(10) 49.6	(10) 26.85	(10)	(7) 41.2	(7) 45.6	(7)
	Means	*9.23*	*66.5*	*50*	*3.55*	*3.45*	*3.99*	*86.5*	*4.96*	*2.68*	*54*	*5.89*	*6.51*	*110.5*
Northwest Australia (7)	Totals	(7) 64.3	(3)	(3)	(3) 10.8	(7) 23.31	(7) 27.8	(7)	(7) 35.05	(7) 19.75	(7)	(3) 18.6	(3) 21.7	(3)
	Means	*9.19*	*67.5*	*49.5*	*3.6*	*3.33*	*3.97*	*83.9*	*5.01*	*2.82*	*56.3*	*6.2*	*7.23*	*116.6*

Central Australia (6) Totals	(5) 46.5	(5)	(5)	(5) 18.4	(6) 19.85	(6) 23.44	(6)	(6) 27.9	(6) 16	(6)	(5) 30.9	(5) 32.3	(5)
Means	*9.3*	*68*	*51*	*3.68*	*3.31*	*3.91*	*84.6*	*4.65*	*2.67*	*57.4*	*6.18*	*6.46*	*104.5*
Locality unknown (7) Totals	(7) 65.6	(7)	(7)	(2) 7	(7) 23.73	(7) 26.86	(7)	(7) 34.15	(7) 18.6	(7)	(7) 43.2	(7) 47.5	(7)
Means	*9.37*	*67*	*49*	*3.5*	*3.39*	*3.84*	*88.3*	*4.88*	*2.66*	*54.5*	*6.17*	*6.79*	*110*
(521) Grand totals	(467) 4,394.6	(411)	(411)	(261) 899.1	(491) 1,638.46	(491) 1,910.32	(491)	(490) 2,384	(490) 1,333	(490)	(434) 2,626.2	(433) 2,896.35	(434)
Averages	*9.41*	*68*	*51*	*3.44*	*3.34*	*3.89*	*85.9*	*4.88*	*2.73*	*56*	*6.19*	*6.81*	*110*
Minima	8.2	59	27	2.7	2.6	3.52	*65*	3.8	2.2	*45.1*	5.5	6	*94.1*
Maxima	10.8	78	69	4.5	3.98	4.62	*103.5*	5.8	3.35	*75*	7.2	8	*128.9*

ABSTRACT: AUSTRALIAN CRANIA—Continued

FEMALE

		Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-NasionHeight (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
South Australia ....(156)	Totals	(156) 2,832.9	(156) 2,003.5	(143) 1,787.5	(156)	(143)	(143)	(76) 797.2	(121) 789.4	(108) 1,350.6	(70)	(105)	(117) 1,192.9	(141) 1,371.3
	Means	*18.16*	*12.84*	*12.5*	*70.7*	*80.7*	*14.49*	*10.49*	*6.52*	*12.5*	*83.8*	*58.2*	*10.2*	*9.72*
Northern Territory ....(80)	Totals	(80) 1,397.2	(80) 998.3	(77) 995	(80)	(77)	(77)	(53) 545.6	(74) 478.4	(72) 891.1	(30)	(70)	(69) 702.5	(77) 752.2
	Means	*17.46*	*12.48*	*12.92*	*71.5*	*86.3*	*14.29*	*10.29*	*6.46*	*12.38*	*83.3*	*52.3*	*10.18*	*9.77*
Queensland ....(51)	Totals	(51) 907.5	(51) 646.4	(50) 644	(51)	(50)	(50)	(32) 331.8	(45) 286.9	(46) 570.6	(31)	(42)	(40) 399.7	(50) 482.9
	Means	*17.79*	*12.67*	*12.88*	*71.2*	*84.5*	*14.45*	*10.37*	*6.38*	*12.4*	*83.8*	*51.4*	*9.99*	*9.66*
Victoria ....(49)	Totals	(49) 888.7	(49) 630.5	(49) 628.1	(49)	(49)	(49)	(24) 250.4	(46) 303.4	(44) 553.8	(24)	(43)	(46) 466.4	(49) 482.4
	Means	*18.14*	*12.87*	*12.82*	*71*	*82.7*	*14.61*	*10.43*	*6.6*	*12.59*	*83.1*	*52.5*	*10.14*	*9.84*
New South Wales ....(44)	Totals	(44) 790.5	(44) 570.4	(43) 558	(44)	(43)	(43)	(18) 187	(40) 256.4	(41) 515.3	(17)	(37)	(38) 382	(43) 419.2
	Means	*17.96*	*12.96*	*12.98*	*72*	*83.9*	*14.64*	*10.39*	*6.41*	*12.57*	*83.7*	*51*	*10.05*	*9.75*
West Australia ....(7)	Totals	(7) 125.5	(7) 89.5	(7) 89.8	(7)	(7)	(7)	(3) 32	(7) 44.7	(7) 86.8	(3)	(7)	(7) 69.5	(7) 66.8
	Means	*17.93*	*12.78*	*12.83*	*71.3*	*84.2*	*14.51*	*10.67*	*6.38*	*12.4*	*84.4*	*51.4*	*9.93*	*9.54*
Northwest Australia ....(3)	Totals	(3) 52.4	(3) 37.6	(3) 38.7	(3)	(3)	(3)	(1) 10.3	(2) 13.1	(3) 37.5	(1)	(2)	(1) 10	(2) 19.3
	Means	*17.47*	*12.53*	*12.9*	*71.7*	*86*	*14.30*		*6.55*	*12.5*	*88*	*54.4*		*9.65*

Central Australia (2)	Totals	(2) 37.7	(2) 25.5	(2) 24.7	(2)	(2)	(2)	(2) 19.9	(1) 6.2	(2) 25	(2)	(1)	(1) 10.3	(2) 19.9
	Means	*18.85*	*12.75*	*12.35*	*67.6*	*78.2*	*14.65*	*9.95*		*12.5*	*79.6*	*48.6*		*9.95*
Locality unknown (3)	Totals	(3) 54.1	(3) 38	(3) 38.5	(3)	(3)	(3)		(3) 19.3	(3) 36.6		(3)	(3) 30.3	(3) 29.3
	Means	*18.03*	*12.67*	*12.83*	*70.3*	*83.6*	*14.51*		*6.43*	*12.2*		*52.7*	*10.1*	*9.77*
(395)		(395)	(395)	(377)	(395)	(377)	(377)	(209)	(339)	(326)	(190)	(319)	(322)	(374)
Grand totals		7,086.5	5,039.7	4,804.3				2,174.2	2,197.8	4,067.3			3,268.6	3,643.3
Averages		*17.94*	*12.76*	*12.74*	*71.1*	*83.1*	*14.48*	*10.4*	*6.48*	*12.48*	*83.6*	*52*	*10.14*	*9.74*
Minima		16.3	11.6	11.3	*63.2*	*73.4*	13.47	9.1	5.5	11.1	*71.3*	*42.6*	8.8	8.9
Maxima		19.2	14.4	14	*81.4*	*93.9*	15.37	11.9	7.6	13.9	*95.8*	*62.5*	11.3	10.7

ABSTRACT: AUSTRALIAN CRANIA—Continued

FEMALE—Continued

		Basion subnasal Pt.	*Facial Angle*	*Alv. Angle*	Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
			°	°										
South Australia (156)	Totals	(124) 1,109.8	(115)	(115)	(73) 224.9	(126) 419.26	(126) 471.16	(126)	(127) 579.55	(127) 321.35	(127)	(111) 656.4	(111) 701.95	(111)
	Means	*8.95*	*67*	*49*	*3.08*	*3.33*	*3.74*	*89*	*4.56*	*2.53*	*55.5*	*5.91*	*6.32*	*106.9*
Northern Territory (80)	Totals	(77) 687.7	(80)	(80)	(41) 124.55	(78) 255.92	(78) 293.18	(78)	(78) 349.35	(78) 195.75	(78)	(80) 402.8	(70) 441.5	(80)
	Means	*8.93*	*67.5*	*48*	*3.04*	*3.28*	*3.76*	*87.2*	*4.6*	*2.58*	*56.1*	*5.84*	*6.31*	*108*
Queensland (51)	Totals	(48) 420.2	(46)	(40)	(33) 99.8	(50) 162.75	(50) 186.65	(50)	(49) 221.45	(49) 126.65	(49)	(46) 230.6	(49) 251.4	(40)
	Means	*8.75*	*68.5*	*49*	*3.02*	*3.26*	*3.73*	*87.4*	*4.52*	*2.58*	*57.1*	*5.76*	*6.28*	*109*
Victoria (49)	Totals	(49) 436.5	(45)	(45)	(25) 78.25	(49) 163.61	(49) 184.73	(49)	(48) 220.35	(48) 124.05	(48)	(44) 255.5	(44) 281	(44)
	Means	*8.91*	*68.5*	*50*	*3.13*	*3.34*	*3.77*	*88.6*	*4.59*	*2.58*	*56.2*	*5.81*	*6.39*	*110*
New South Wales (44)	Totals	(42) 372.9	(36)	(36)	(18) 496.5	(44) 143.35	(44) 164.33	(44)	(43) 194.78	(43) 112.75	(43)	(40) 232.6	(40) 256.2	(40)
	Means	*8.88*	*69*	*50*	*3.1*	*3.26*	*3.73*	*87.4*	*4.53*	*2.62*	*57.8*	*5.82*	*6.4*	*110*
West Australia (7)	Totals	(7) 60.8	(7)	(7)	(1) 3.3	(7) 22.88	(7) 26.82	(7)	(7) 31.55	(7) 18.15	(7)	(7) 41	(7) 44.7	(7)
	Means	*8.68*	*68*	*47.5*		*3.27*	*3.83*	*85.4*	*4.51*	*2.59*	*57.4*	*5.86*	*6.38*	*108.9*
Northwest Australia (3)	Totals	(3) 26.5	(1)	(1)		(3) 10.3	(3) 11.35	(3)	(2) 9.8	(3) 7.55	(2)	(1) 5.6	(1) 6.4	(1)
	Means	*8.83*	*69.5*	*43.5*		*3.43*	*3.78*	*90.7*	*4.9*	*2.52*	*49.5*			*114.3*

Central Australia (2)	Totals	(2) 17.5	(1)	(1)	5.8	(2) 6.45	(2) 7.55	(2)	(2) 9.3	(2) 5.2	(2)	(1) 5.9	(1) 6.5	(1)
	Means	*8.75*	*70.5*	*51.5*	*2.9*	*3.22*	*3.78*	*85.2*	*4.65*	*2.6*	*55.9*			*110.2*
Locality unknown (3)	Totals	(3) 27	(3)	(3)		(3) 9.75	(3) 11.1	(3)	(3) 13.5	(3) 7.8	(3)	(3) 17.1	(3) 18.3	(3)
	Means	*9*	*68.5*	*52.5*		*3.25*	*3.7*	*87.8*	*4.5*	*2.6*	*57.8*	*5.7*	*6.1*	*107*
Grand totals (395)		(355) 3,158.9	(310)	(316)	(191) 586.25	(362) 1,194.27	(362) 1,356.87	(362)	(357) 1,629.63	(358) 919.25	(357)	(316) 1,847.5	(317) 2,007.95	(320)
Averages		*8.9*	*67.5*	*48*	*3.07*	*3.3*	*3.75*	*88*	*4.56*	*2.57*	*56.4*	*5.85*	*6.33*	*108.2*
Minima		7.6	58.5	32	2.6	2.9	33.5	*76.3*	3.5	2.1	*44.9*	5	5.6	*94*
Maxima		10	77	66	3.95	3.8	4.1	*100*	5.3	3.2	*74.4*	6.8	7	*125.9*

TASMANIANS

TASMANIAN CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
[a] 1104	College of Surgeons		Adult	19.1	13.3	13.7	*69.6*	*84.6*	15.87		7	[b] 14.1		*49.6*	11	11.4
[b] B	Dr. Pulleine's		do	20.6	14.4	13.5	*69.9*	*77.1*	16.17		7.4	14.2		*52.1*	11.4	10.5
[a] 1412	College of Surgeons		do	19.9	14.2	13.7	*71.4*	*80.6*	15.93	[g] 11.5	6.9				11	10.3
[a] 1100	do		do	19	13.6	14	*71.6*	*85.9*	15.53		7.3				10.5	10.2
[a] 1419	do		do	18.4	13.2	13.4	*71.7*	*84.8*	15	[27] 10.8	6.7	13.1	*83.4*	*51.2*	10.9	9.9
[b] C	Dr. Pulleine's		do	19.5	14		*71.8*									
26899	N. M. M.	Northeast coast	do	19	13.7	13.7	*72.1*	*83.5*	15.47			13.9				10.3
[d] D	Dr. Pulleine's		do	19	13.8	13.2	*72.6*	*80.5*	15.33			14.2				10.4
[a] 1408	College of Surgeons		do	19.2	14	13.6	*72.9*	*81.9*	15.60		6.8					10.4
[a] 1406	do		do	19.4	14.2	13.6	*73.2*	*81*	15.73	[f] [g] 11.9	6.8	13.6	*87.5*	*50*	11	10.4
[a] 1411	do		do	18.9	14	13.4	*74.1*	*81.7*	15.43		6.4	13.1		*48.8*	10.6	10.3
[a] 1417	do		do	18.5	13.7	13.5	*74*	*83.8*	15.23	[f] [g] 10.9	6	13	*83.8*	*46.2*	10.5	10.2
[c] 1418	do		do	19.4	14.4	13.2	*74.2*	*78.1*	15.67	[g] 11.2	(13)	[g] 13.7	*81.8*			10.4
[e] 1113-1	do		do	19	14.2	13.4	*74.7*	*80.7*	15.53	[27] 11.1	6.5	13.5	*82.2*	*48.2*	10.2	10.2
[a] 1407	do		do	18.3	13.7	13	*74.9*	*81.2*	15		6.6				10.4	10
[g] 1101	do		do	18.4	13.8	13	*75*	*80.8*	15.07		(41)					9.9
A	Dr. Pulleine's		do	19.4	14.6	13.3	*75.3*	*78.2*	15.77		7.9	13.7		*57.7*	10	9.4
[a] 1096	College of Surgeons		do	18.4	13.9	13.4	*75.5*	*82.7*	15.23	[27] 11.1	(12 42)	13.7	*81*			9.7
[a] 1098	do		do	18.2	13.8	13.6	*75.8*	*85*	15.20	(f)	6.3	14.1		*44.7*	10.4	9.2
[a] 1099	do		do	18.4	14	13.4	*76.1*	*82.7*	15.27	(f)	6.7	13.1		*51.2*	10.4	10.2
[h] 1102	do		do	18.5	14.2	12.8	*76.8*	*78*	15.17		(41)					10
[i] 1109-1	do		do	17.8	13.9	13	*78.1*	*82.5*	14.90		6.2	13		*47.7*	10.9	10
Totals				(22) 416.3	(22) 306.6	(21) 281.4	(22)	(21)	(21)	(7) 78.5	(15) 101.5	(15) 204	(6)	(11)	(14) 149.2	(21) 213.3
Averages				*18.93*	*13.94*	*13.4*	*74.1*	*81.6*	*15.41*	*11.21*	*6.77*	*13.6*	*83.1*	*49.8*	*10.66*	*10.16*
Minima				17.8	13.2	12.8	*69.6*	*77.1*	14.90	10.8	6	13	*81*	*44.7*	10	9.2
Maxima				20.6	14.6	14	*78.1*	*85.9*	16.17	11.9	7.9	14.2	*87.5*	*57.7*	11.4	11.4

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle °	Alv. Angle °	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
[a] 1104	College of Surgeons		Adult	10	75	50.5		3.28	3.75	*87.5*	[18] 5.5	2.65	*48.2*	5.8	6.6	*113.8*
[b] B	Dr. Pulleine's		do	10.1	64	52.5		3.18	3.9	*81.5*	[f] 5	2.75	*55*	6.7	7.3	*109*
[c] 1412	College of Surgeons		do	9.8	66	49	3.2	3.3	3.85	*85.7*	5	2.9	*58*	6.1	6.9	*113.1*
[a] 1100	do		do	9.3	67.5	53.5		[19] 3.3	[19] 3.8	*86.8*	[k] 5.1	2.7	*52.9*	6.3	7.3	*115.9*
[a] 1419	do		do	9.8	63.5	56.5	3.3	2.9	3.7	*78.4*	4.4	2.7	*61.4*	6.3	7.1	*112.7*
[b] C	Dr. Pulleine's		do					[19] 3.45	[g] [19] 4	*86.2*						
28899	N. M. M	Northeast coast	do	9.9				3.05	3.8	*80.3*	5.3	2.9	*54.7*			
[d] D	Dr. Pulleine's		do													
[a] 1408	College of Surgeons		do	9.4				[19] 3.2	[19] 4.1	*78*	4.85	2.85	*58.8*			
[a] 1406	do		do	9.8	67	49	3.3	3.02	3.8	*79.5*	[18] 4.9	2.65	*54.1*	6.7	7	*104.5*
[c] 1411	do		do	9.6	70	54.5		3.05	3.68	*82.9*	4.6	2.7	*58.7*	6	[j] 7.1	*118.3*
[c] 1417	do		do	9.5	70.5	49.5	3	2.85	3.88	*73.4*	4.5	2.9	*64.4*	6.2	[l] 6.6	*106.4*
[c] 1418	do		do	10			3	3.08	3.8	*81.1*	4.8	2.95	*61.5*		(m)	
[e] 1113–1	do		do	9.4	71.5	62	3.2	2.95	3.8	*77.6*	4.55	2.7	*59.3*	5.9	7.2[c]	*122*
[a] 1407	do		do	9.4	68	56.5		2.95	3.88	*76*	4.55	2.7	*59.3*	6.3	7	*111.1*
[f] 1101	do		do	9.2				3	3.92	*76.5*	4.3	2.45	*57*			
A	Dr. Pulleine's		do	8.8	62	58	[i] 3.3	3.12	3.95	*79*	[m] 5.1	2.3	*45.1*	6.1	7	*114.8*
[a] 1096	College of Surgeons		do	9			2.8	3.2	4.05	*79*	[18] 4.9	3	*61.2*			
[c] 1098	do		do	9.2	61.5	50		3.08	3.9	*79*	4.3	2.6	*60.5*	6.5	6.5	*100*
[a] 1099	do		do	9.4	69.5	54.5		3	3.75	*80*	[18] 4.9	2.8	*57.1*	6.1	7.2	*118*
[h] 1102	do		do	9.2				2.85	3.48	*81.9*	4.9	2.6	*53.1*	[l] 6	6.5	*108.3*
[i] 1109–1	do		do	9.9	65	54.5		2.8	3.63	*76.1*	4.3	2.45	*57*	6.3	6.7	*106.4*
Totals				(20) 190.7	(14)	(14)	(8) 25.1	(21) 64.61	(21) 80.47	(21)	(20) 95.75	(20) 54.25	(20)	(15) 93.3	(15) 104	(15)
Averages				*9.54*	*68*	*52.5*	*3.14*	*3.08*	*3.83*	*80.3*	*4.79*	*2.71*	*56.7*	*6.22*	*6.93*	*111.4*
Minima				8.8	61.5	49	2.8	2.8	3.48	*73.4*	4.3	2.3	*45.1*	5.8	6.5	*100*
Maxima				10.1	75	62	3.3	3.45	4.1	*87.5*	5.5	3	*64.4*	6.7	7.3	*122*

[a] (1) Near Australian type, except nose, somewhat.
[b] (2) Type quite Australian.
[c] (3) Australian type.
[d] (4) Metopic suture.
[e] (5) Near Australian type.
[f] (c) All upper incisors shovel-shaped.
[g] (6) Near Australian type. Face and mastoids somewhat female-like, but probably male.
NOTE.—For footnotes to reference figures see p. 3.

[h] (7) Near Australian type. Face and zygomae somewhat female-like, but probably male.
[i] (8) Australian type. Surely male.
[j] (a) Moderate gutters.
[k] (b) Large Fossae.
[l] (d) Diameter antero-posterior of both left and right lower molars (1, 2, 3)=4.—cm.
[m] (e) Diameter antero-posterior at middle of lower right first molar and second molar = 2.8 cm.
[n] (g) Large fossae, partly intranasal, as in Australians.

TASMANIAN CRANIA—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
• A577	S. A. M. A.		Adult	18.2	13	12.9	*71.4*	*82.7*	14.70		6.2	12.2		*50.8*	10.6	10.5
1106	College of Surgeons		do	17.6	12.8	12.8	*72.7*	*84.2*	14.40	[9] 10	6.2	11.9	*84*	*52.1*	9.4	9.7
1409	do		do	18	13.4	12.6	*74.4*	*80.2*	14.67		6.7	12.8		*52.3*	10.4	10
• E	Dr. Pulleine's		do	18.4	13.7	12.7	*74.5*	*79.4*	14.93	[4] 11.2	7	13.2	*84.8*	*53*	10.4	9.8
• 1410	College of Surgeons		do	18	13.5	13.3	*75*	*84.2*	14.93		6.6	13		*50.8*	9.8	9.8
1107	do		do	17.6	13.2	12.6	*75*	*81.8*	14.47		5.6				9	9.2
• 1421	do		do	18.2	13.7	12.6	*75.3*	*78.8*	14.83		7.4	[5] 12.9		*57.4*	10	9.9
1109	do		do	17.8	13.5	12.4	*75.8*	*79.5*	14.57		5.7	12.6		*45.2*	9.9	9.2
• 1097	do		do	17.5	13.3	11.9	*76*	*77.3*	14.23	[9] 9.8	(35)	12	*81.7*			8.7
1415	do		do	17.6	13.6	12.9	*77.3*	*82.7*	14.70	[27] 10.1	6.1	13.2	*76.5*	*46.2*	10.2	10.2
1108	do		do	17.3	13.5	12.4	*78*	*80.5*	14.40	(•)	6.1	[5] 12.3		*49.6*	9.8	9.5
1420	do		do	17.5	13.8	12.6	*78.9*	*80.8*	14.63	[9] 9.8	6.2	12.6	*77.8*	*49.2*	9.8	9.3
1110	do		do	16.6	13.2	12.2	*79.5*	*81.9*	14		6.8	12.3		*55.3*	10	9.4
1106	do		do	16.3	13	12.3	*79.8*	*84.2*	13.87	[9] 9.1	[5] 5.4	11.5	*79.1*	*47*	9	9.1
1105	do		do	16.8	13.5	12.6	*80.4*	*82.9*	14.30		5.8	11.9		*48.7*	9.4	8.9
				(15)	(15)	(15)	(15)	(15)	(15)	(6)	(14)	(14)	(6)	(14)	(14)	(15)
Totals				263.4	200.7	188.8				60	87.8	174.4			137.7	143.2
Averages				*17.56*	*13.38*	*12.59*	*76.2*	*81.4*	*14.51*	*10*	*6.27*	*12.46*	*80.6*	*50.4*	*9.84*	*9.55*
Minima				16.3	12.8	11.9	*71.4*	*77.3*	13.87	9.1	5.4	11.5	*76.5*	*45.2*	9	8.7
Maxima				18.4	13.8	13.3	*80.4*	*84.2*	14.93	11.2	7.4	13.2	*84.8*	*57.4*	10.6	10.5

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
					°	°										
[a] A577	S. A. M. A.		Adult	9.6	72	55		[20] 3.2	[20] 3.8	*84.2*	[f] 4.4	2.6	*59.1*	5.9	6.5	*110.2*
1106	College of Surgeons		do	8.6	74	57	2.7	3.25	3.52	*92.3*	4.65	2.55	*54.8*	5.3	6.3	*118.9*
1409	do		do	9.4	68	54.5		3.1	3.8	*81.6*	4.85	2.8	*57.7*	6	[b] 7	*116.7*
[a] E	Dr. Pulleine's		do	8.8	65	44	3.25	3.48	3.95	*88.1*	[f] 4.8	3	*62.5*	6.2	7	*112.9*
[b] 1410	College of Surgeons		do	9	70.5	61		3.05	3.78	*82.6*	4.7	2.75	*58.5*	5.6	6.5	*116.1*
1107	do		do	8.4	74.5	57		[19] 3.1	[19] 3.6	*86.1*	4.45	2.45	*55.1*	5.3	6	*113.2*
[c] 1421	do		do	8.8	67.5	56.5	3.4	3.55	3.75	*94.7*	4.85	2.65	*54.6*	5.5	6.3	*114.6*
1109	do		do	8.7	66	38.5		3	3.7	*81.1*	4.3	2.75	*63.9*	5.9	6.4	*108.5*
[d] 10 7	do		do	8.3			2.4	3.18	3.62	*87.8*	4.55	2.65	*58.2*			
1415	do		do	9.5	72.5	55	2.9	3.05	3.78	*80.7*	[18] 4.85	2.5	*51.6*	5.6	6.6	*117.9*
1103	do		do	8.8	69	54		2.9	3.55	*81.7*	4.3	2.7	*62.8*	5.8	6.4	*110.3*
1420	do		do	8.6	67	52	2.7	2.9	3.78	*76.7*	[g] 4.1	2.5	*61*	5.7	6.5	*114*
1110	do		do	8.6	65	47		3.22	3.7	*87*	4.7	2.6	*55.3*	5.8	6.7	*116.5*
1108	do		do	8.6	74	68	2.2	2.92	3.68	*79.4*	[18] 4.1	2.5	*61*	5.2	6	*115.4*
1105	do		do	8.6	66.5	60		2.92	3.6	*81.1*	3.9	2.45	*62.8*	5.6	6.4	*114.3*
Totals				(15) 132.3	(14)	(14)	(7) 19.55	(15) 46.82	(15) 55.61	(15)	(15) 67.5	(15) 39.45	(15)	(14) 79.4	(14) 90.6	(14)
Averages				*8.82*	*69.5*	*53.5*	*2.79*	*3.12*	*3.71*	*84.2*	*4.5*	*2.63*	*58.4*	*5.67*	*6.47*	*114.1*
Minima				8.3	65	38.5	2.2	2.9	3.52	*76.7*	3.9	2.45	*54.6*	5.2	6	*108.5*
Maxima				9.6	74	68	3.4	3.55	3.95	*94.7*	4.85	3	*63.9*	6.2	7	*118.9*

[a] Australian type.
[b] Somewhat malelike, especially in mastoids; possibly male.
[c] Surely female.
[d] Metopic suture.
[e] Upper median incisors shovel-shaped, laterals slightly.
[f] Moderate gutters.
[g] Moderate intranasal shelves.

NOTE.—For footnotes to reference figures see p. 3.

NEW CALEDONIANS

NEW CALEDONIAN CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
[a] S634	A. M. S.		Adult	18.6	12.4	13.4	*66.7*	*86.4*	14.80		[3] [26] 7	13.9		*50.4*	[5] 10.6	10
S635	do.		do.	19.7	13.2	14.9	*67*	*90.6*	15.93		6.8	13.7		*49.6*	10.8	10.7
S1053	do.		do.	19	12.9	13.4	*67.9*	*83.8*	15.10		7	13.1		*53.4*	10.9	10.4
S806	do.		do.	19.3	13.3	14.4	*68.9*	*88.3*	15.67	[9] 12	[b] 7.1	13.1	*91.6*	*54.2*	10.8	10.7
S1054	do.		do.	18.6	13.4	14.1	*72*	*88.1*	15.37	[4] 11.8	7.2	13.6	*86.8*	*52.9*	10.8	10.1
[c] S1602	do.		do.	(18.1)	(13.5)	(13.5)	*(74.6)*	*(85.4)*	(15.03)	[9] 11.8	7.1	13.6	*86.8*	*52.3*	11	10.6
Totals				(5) 95.2	(5) 65.2	(5) 70.2	(5)	(5)	(5)	(3) 35.6	(6) 42.2	(6) 81	(3)	(6)	(6) 64.9	(6) 62.5
Averages				*19.04*	*13.04*	*14.04*	*68.5*	*87.5*	*15.37*	*11.87*	*7.03*	*13.5*	*88.4*	*52.1*	*10.82*	*10.42*

Catalogue No. •	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle •	Alv. Angle •	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
[a] S634	A. M. S.		Adult	9.4	61	51	------	3.38	3.75	*90.1*	4.95	2.5	*50.5*	------	------	------
S635	do		do	9.8	71	56	------	3.5	3.85	*90.9*	[d] 4.9	2.75	*56.1*	6.1	6.7	*109.8*
S1053	do		do	9.6	67	52	3.3	3.5	4	*87.5*	[9] 4.7	2.5	*53.2*	6	6.7	*111.7*
S806	do		do	9.8	70	59.5	3.6	3.4	3.7	*91.9*	4.8	2.45	*51*	6.1	6.8	*111.5*
S1054	do		do	9.4	65	53	3.4	[30] 3.4	[30] 4.1	*82.9*	4.55	2.35	*51.7*	6.3	6.2	*98.4*
[a] S1602	do		do	9.8	68	54	3.4	3.25	3.7	*87.8*	[41] 4.85	2.3	*47.4*	5.9	6.3	*106.8*
Totals				(6) 57.8	(6) ------	(6) ------	(4) 13.70	(6) 20.43	(6) 23.1	(6) ------	(6) 28.75	(6) 14.85	(6) ------	(5) 30.4	(5) 32.7	(5) ------
Averages				*9.63*	*68*	*54*	*3.42*	*3.4*	*3.85*	*88.3*	*4.79*	*2.48*	*51.8*	*6.08*	*6.54*	*107.6*

[a] Surely male.
[b] Upper incisors shovel-shaped, laterals moderately, medians slightly. A rudimentary tooth on external surface behind upper third molar.
[c] Medium occipital compression.
[d] Marked intranasal shelves.

NOTE.—For footnotes to reference figures see p. 3.

NEW CALEDONIAN CRANIA—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-NasionHeight (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol Pt. (x)	Basion-Nasion (y)
ª 1208	A. M. S.		Adult	17.9	11.7	13	*65.4*	*87.8*	14.20		7	12.2		*57.4*	11	10.1
S1052	do.		do.	17.6	14	13.1	*79.6*	*82.9*	14.90		6.8	13.2		*51.5*	11.1	10.6
Totals				(2) 35.5	(2) 25.7	(2) 26.1	(2)	(2)	(2)		(2) 13.8	(2) 25.4		(2)	(2) 22.1	(2) 20.7
Averages				*17.75*	*12.85*	*13.05*	*72.4*	*85.3*	*14.55*		*6.9*	*12.7*		*54.3*	*11.05*	*10.35*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
ª 1208	A. M. S.		Adult	9.7	° 64	° 51		3.35	3.5	*95.7*	4.75	2.3	*48.4*	5.9	5.7	*96.6*
S1052	do.		do.	10	68	55.5		3.22	3.6	*89.5*	ᵇ 4.6	2.4	*52.2*	6	6.3	*105*
Totals				(2) 19.7	(2)	(2)		(2) 6.57	(2) 7.1	(2)	(2) 9.35	(2) 4.7	(2)	(2) 11.9	(2) 12	(2)
Averages				*9.85*	*66*	*53.5*		*3.28*	*3.55*	*92.4*	*4.68*	*2.35*	*50.2*	*5.95*	*6*	*100.8*

ª Somewhat malelike (malars and zygomae, mastoids), but physiognomy female, and no supraorbital ridges.
ᵇ Lower border distinct.

NOTE.—For footnotes to reference figures see p. 3.

Comparison of measurements

MALE

Group	No.	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
Australian	(521)	18. 91	13. 22	13. 36	*69. 9*	*85. 2*	15. 16	11. 37	6. 96	13. 58	*84*	*51. 2*	10. 66	10. 3
Tasmanian	(22)	18. 93	13. 94	13. 4	*74. 1*	*81. 6*	15. 41	11. 21	6. 77	13. 6	*83. 1*	*49. 8*	10. 66	10. 16
New Caledonian	(6)	19. 04	13. 04	14. 04	*68. 5*	*87. 5*	15. 37	11. 87	7. 03	13. 5	*88. 4*	*52. 1*	10. 82	10. 42

Group	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
Australian	9. 41	68	51	3. 44	3. 34	3. 89	*85. 9*	4. 88	2. 73	*56*	6. 19	6. 81	*110*
Tasmanian	9. 54	68	52. 5	3. 14	3. 08	3. 83	*80. 3*	4. 79	2. 71	*56. 7*	6. 22	6. 93	*111. 4*
New Caledonian	9. 63	68	54	3. 42	3. 4	3. 85	*88. 3*	4. 79	2. 48	*51. 8*	6. 08	6. 54	*107. 6*

Comparison of measurements—Continued

FEMALE

Group	No.	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-NasionHeight (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
Australian	(395)	17.94	12.76	12.74	*71.1*	*83.1*	14.48	10.4	6.48	12.48	*83.6*	*52*	10.14	9.74
Tasmanian	(15)	17.56	13.38	12.59	*76.2*	*81.4*	14.51	10	6.27	12.46	*80.6*	*50.4*	9.84	9.55
New Caledonian	(2)	17.75	12.85	13.05	*72.4*	*85.3*	14.55	------	6.9	12.7	------	*54.3*	11.05	10.35

Group	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
		°	°										
Australian	8.9	67.5	48	3.07	3.3	3.75	*88*	4.56	2.57	*56.4*	5.85	6.33	*108.2*
Tasmanian	8.82	69.5	53.5	2.79	3.12	3.71	*84.2*	4.5	2.63	*58.4*	5.67	6.47	*114.1*
New Caledonian	9.85	66	53.5	------	3.28	3.55	*92.4*	4.68	2.35	*50.2*	5.95	6	*100.8*

Australians territorially, and contrasted with Tasmanians and New Caledonians

SEXES SEPARATELY

•	Cranial Index		Mean Height Index			Cranial Module			Facial Index, upper			Facial Angle			Orbital Index			Nasal Index			Palatal Index		
	Male	Female		Male	Female		Male	Female		Male	Female		Male	Female		Male	Female		Male	Female		Male	Female
N.W.A.	68.8	71.7	So. A.	80.7	80.7	N. T.	14.99	14.29	C. A.	(50.4)	(49.6)	W. A.	66.5	68.0	N. W.A.	83.9	(90.7)	W. A.	54.0	57.4	C. A.	104.5	-----
N. T.	69.6	71.5	C. A.	80.7	([1])	W. A.	15.01	14.51	Q.	50.9	51.4	S. A.	67.0	67.0	C. A.	84.6	(85.2)	S. A.	55.0	55.5	S. A.	109.3	108.9
So. A.	69.7	70.7	W. A.	82.8	84.2	N. W.	15.02	14.80	N. T.	51	52.3	1 V.	67.5	68.5	V.	84.7	88.6	N. T.	55.9	56.1	N. T.	109.3	108.0
N. S.W.	69.9	72	N. S.W.	83.4	83.9	Q.	15.14	14.45	V.	51.2	52.5	N. W. A.	67.5	-----	N. T.	85.1	87.2	N.W. A.	56.3	([1])	W. A.	110.5	108.9
Q.	70.3	71.2	N. W. A.	83.5	86.0	S. A.	15.15	14.49	S. A.	51.2	52.2	N. S.W.	68.0	69.0	N. S.W.	85.1	87.4	Q.	56.6	57.1	V.	110.8	110.0
V.	70.4	71.0	V.	84.1	82.7	C. A.	15.17	([1])	N. S.W.	51.4	51	C. A.	68.0	-----	W. A.	86.5	(85.4)	N. S.W.	57.1	57.8	N. S.W.	111.1	110.0
W. A.	71.2	71.3	Q.	85.7	84.5	N.S.W.	15.25	14.64	W. A.	52.3	51.4	N. T.	68.5	67.5	Q.	86.6	87.4	V.	57.2	56.2	Q.	113.0	109.0
C. A.	71.5	([1])	N. T.	86.0	86.3	V.	15.40	14.61	N. W.A.	(54.6)	(54.4)	Q.	69.0	68.5	S. A.	86.8	89.0	C. A.	57.4	55.9	N.W. A.	116.6	114.3
ALL AUSTRALIANS																							
	69.9	71.1		83.2	83.1		15.16	14.48		51.2	52.9		68.0	67.5		85.9	88.0		56.0	56.4		110.0	108.2
TASMANIANS																							
	74.1	76.2		81.6	81.4		15.41	14.51		49.8	50.4		68.0	69.5		80.3	84.2		56.7	58.4		111.4	114.1
NEW CALEDONIANS																							
	68.5	(72.4)		87.5	(85.3)		15.37	14.55		52.1	54.3		68.0	66.0		88.3	(92.4)		51.8	50.2		107.6	108.8

[1] Only two specimens.

Australians territorially, and contrasted with Tasmanians and New Caledonians—Continued

THE TWO SEXES TAKEN TOGETHER

Cranial Index	Mean Height Index	Cranial Module	Facial Index, Anat.	Facial Angle	Orbital Index	Nasal Index	Palatal Index
N. W. A.---(10) 69.7	C. A.------(8) 80.1	N. T.---(178) 14.69	C. A.------(6) 50.3	S. A.----(265) 67°	C. A.------(8) 84.8	N. W. A.--(9) 54.8	C. A.------(6) 105.5
S. A.------(353) 70.2	S. A.----(329) 80.7	N. W. A.-(10) 14.80	Q.--------(82) 51.2	W. A.---(14) 67	N. W. A.--(10) 85.9	S. A.----(303) 55.2	S. A.----(268) 108.3
N. T.-----(183) 70.4	W. A.----(17) 83.4	Q.------ (99) 14.80	N. S. W.--(76) 51.2	V.-------(109) 68	N. T.----(185) 86	W. A.----(17) 55.4	N. T.---(164) 108.8
C. A.--------(8) 70.5	V.-------(121) 83.5	W. A.---(17) 14.80	S. A.----(262) 51.6	N. W. A.---(4) 68	W. A.----(17) 86	N. T.----(182) 56	W. A.----(14) 109.7
V.---------(123) 70.6	N. S. W.--(96) 83.6	S. A.----(329) 14.86	N. T.----(162) 51.6	N. T.----(158) 68	N. S. W.--(99) 86.1	V.-------(120) 56.8	V.-------(109) 110.5
N. S. W.---(103) 70.8	N. W. A.--(10) 84.2	N. S. W.-(96) 14.98	V.-------(106) 51.8	N. S. W.--(80) 68.5	V.-------(121) 86.2	Q.--------(98) 56.9	N. S. W.--(84) 110.6
Q.--------(100) 70.8	Q.--------(99) 85.2	C. A.-----(8) 15.04	W. A.----(14) 51.9	C. A.------(6) 68.5	Q.-------(101) 87	C. A.------(8) 57	Q.--------(81) 111
W. A.------(17) 71.2	N. T.----(178) 86.2	V.------(121) 15.08	N. W. A.---(6) 54.5	Q.--------(81) 69	S. A.----(302) 87.7	N. S. W.--(99) 57.4	N. W. A.---(4) 116
ALL AUSTRALIANS							
(907) 70.4	(858) 83.2	(868) 14.86	(724) 51.6	(727) 68	(853) 86.8	(846) 56.2	(740) 109.2
TASMANIANS							
(37) 75	(36) 81.5	(36) 15.04	(25) 50.2	(28) 69	(36) 81.9	(35) 57.4	(29) 112.7
NEW CALEDONIANS							
(7) 69.6	(7) 86.9	(7) 15.14	(8) 52.7	(8) 67.5	(8) 89.3	(81) 51.4	(7) 105.7

COMMENTS ON THE AUSTRALIANS

The Australians, while generally related, are not of exactly the same type in all parts of the territory.

They are all characterized by relative narrowness of the head and hence marked dolichocephaly. But they differ moderately in this respect in the several territories. The most pronounced dolichocephaly is met with in the northwest, north, and central south, the least pronounced in the west, east, and southeast.

Much more marked differences, however, are found in the height of the vault and the mean height index $\left(\frac{\text{H}}{\text{mean of L+B}}\right)$. Both the absolute height and the index are lowest or next to lowest in south Australia, where the cephalic index is also low; and both are high in Queensland where the cephalic index is also higher. On the other hand in northwestern and northern Australia, where the cephalic index is decidedly low, the height index is near or at the maximum.

In size, the skull is smallest in the northern territory and northwestern Australia, largest in Victoria. In the northwest the condition is possibly especially significant, as it seems to be associated with a higher stature; but the data, both on the living and on the skulls, are not sufficient for definite conclusions.

The basion-nasion length ranges from 9.9 cm. in western Australia to 10.15 cm. in Victoria. Relatively to skull length it gives the index (or percentage) of from 52.8 in northwestern Australia to 53.3 in central Australia, showing great uniformity. But it is 54.2 in the northern territory, where the length of the head in both sexes, as well as the size of the head, are the smallest. Evidently the smallness of the vault in this exceptional series is due especially to deficiency in the posterior half of the skull.

The upper facial index is lowest in central Australia, Queensland, and New South Wales, highest in the western and northwestern Provinces. But if central Australia on one hand and northwestern Australia on the other be eliminated, as they may well be on account of the small numbers of specimens, then the index is seen to present a remarkable uniformity, greater than any of the other characters, excepting the facial angle.

The facial angle is lowest (greatest prognathism) in south and west Australia, highest in Queensland.

The orbital index is lowest in the northwest, highest in Queensland and southern Australia.

The nasal index is lowest in western and southern, highest in eastern, central, and southeastern Australia.

The palate is relatively longest (or narrowest) in central and south Australia (which shows also the highest facial angle), relatively

shortest (or broadest) in Queensland (with lowest facial angle) and especially in northwest Australia.

On the whole the lower types of the Australian appear to be those of the northwest and north, the higher those of the southeastern parts of the continent.

Admixture (Papuan) and local variation are doubtless both involved in the observed differences of characters. But these differences are so appreciable that anthropology will hardly be justified henceforth to refer merely to "the Australian."

AUSTRALIANS AND TASMANIANS

A comparison of the two groups shows that the Tasmanian was not of the identical type with the Australian of any part of the continent; but he was close enough, in general, to be recognized as a near relation and probably a mere local variant of the Australian.

Compared with the Australian more in detail, the Tasmanian is seen to have been somewhat more broad-headed.

The vault of his skull was slightly lower than the general Australian average, but above that of two of the Australian groups.

In size of the head the Tasmanian was slightly above the Australian average, but equal or even a trace lower than two of the Australian contingents.

In facial index the Tasmanian was slightly lower than the Australian in the males, somewhat more so in the females, due to lower facial height (the bizygomatic breadth being practically even).

The basion-nasion length, especially if taken relatively to the length of the skull, is nearly the same in the two people.

The facial angle in the Tasmanians, though their face is lower, exceeds on the average by 1 degree that of the Australians.

The orbital index of the Tasmanians is plainly lower—due to lower orbits—than it is in the Australians.

The nasal index in the male Tasmanians is close to the average of the Australian males, but in the females the Tasmanians show an appreciably higher index (greater breadth); and practically the same condition exists as to the "palatal" (alveolar arch) index and the arch itself.

In general, it is seen, the Tasmanians had a somewhat broader head, somewhat lower face and orbits, and somewhat broader (or shorter) nose and palate, than the Australians. But the two people are so near, particularly when we compare the crania individually or when the Tasmanians are contrasted with some of the regional Australian groups, that the two strains can not but be regarded as of fundamentally the same race. The Tasmanians may therefore, it seems, be legitimately considered as merely a subtype of the

Australians. Their facial differences as well as those of the vault indicate probably environmental (especially food), rather than racial characters.

NEW CALEDONIANS

The New Caledonians, even though represented by but a small series of specimens, are plainly a type apart from both the Australians and Tasmanians; they are in most respects even farther away from the Tasmanians than from the Australians; and there appears no reason to consider them as related, except perhaps very distantly, to either.

The New Caledonians are especially characterized by narrowness of the head, high vault, high face, high orbits, narrow nose and narrow palate.

MELANESIANS

NEW GUINEA CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
227342	U. S. N. M.	New Guinea	Near adult	19.4	[2] 13.1		*67.5*				[2] 10.6	6.4	12.7	*83.5*	*50.4*		
219263	do	do	Adult	19.3	13.2	14.1	*68.4*	*86.5*	15.53	1,450	[4] 11.4	7	12.8	*89.1*	*54.7*	10.2	10.2
219395	do	do	do	18	13.2	13.5	*73.3*	*86.5*	14.90	1,400	11.5	[2] 7					9.6
219393	do	do	do	18.4	13.6	14.1	*73.9*	*88.1*	15.37	1,405	[2] 11.3	[2] 7	13.2	*85.6*	*53*		10.1
Totals				(4) 75.1	(4) 53.1	(3) 41.7	(4)	(3)	(3) 45.8	(3) 4,255	(4) 44.8	(4) 27.4	(3) 38.7	(3)	(3)		(3) 29.9
Averages				*18.78*	*13.28*	*13.9*	*70.7*	*87.2*	*15.27*	*1,418*	*11.2*	*6.85*	*12.9*	*88*	*52.7*		*9.97*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°										
227342	U. S. N. M.	New Guinea	Near adult				3.2	3.6	4.1	*87.8*	4.7	2.8	*59.6*		6.6	
219263	do	do	Adult	8.9	70	52	3.2	3.35			4.8	2.4	*60*	6	6.9	*116*
219395	do	do	do	9				[5] 3.3	[5] 3.9	*84.6*	[2] 5	2.7	*54*		6.6	
219393	do	do	do	8.9				3.3	3.9	*84.6*	5	2.8	*56*		6.6	
Totals				(3) 26.8			(2) 6.4	(4) 13.55	(3) 11.9	(3)	(4) 19.5	(4) 10.7	(4)		(4) 26.7	
Averages				*8.93*			*3.2*	*3.39*	*3.97*	*85.7*	*4.88*	*2.68*	*54.9*		*6.68*	

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
219392	U. S. N. M.	New Guinea	Adult	17.2	11.8	12.2	*68.6*	*84.1*	13.73	1,050	[3] 11	6.7	11.4	*96.5*	*58.8*	9.7	9.4
219261	do	do	do	17.4	12.4	13	*71.5*	*87.2*	14.27	1,230	10.3		12.1	*85.1*		9.8	9.8
226163	do	Southern New Guinea	do	18.2	13		*71.4*			1,255		6.8	12		*56.7*		
219262	do	New Guinea	do	17.2	13.1	13	*76.2*	*85.5*	14.43	1,150		(6.6)	11.4		(*57.9*)		9.7
219264	do	do	do	17.3	13.2	13.7	*76.3*	*89.5*	14.73	1,290							10
219260	do	do	do	16.5	12.7	13.2	*77*	*90.4*	14.13	1,170			11.3			[3] 9.4	
Totals				(6) 103.8	(6) 76.2	(5) 65.1	(6)	(5)	(5) 71.29	(6) 7,145	(2) 21.3	(2) 13.5	(5) 58.2	(2)	(2)	(3) 28.9	(4) 38.9
Averages				*17.3*	*12.7*	*13.02*	*73.4*	*87.5*	*14.26*	*1,191*	*10.65*	*6.75*	*11.64*	*90.6*	*57.7*	*9.63*	*9.72*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
219392	U. S. N. M.	New Guinea	Adult	8.6	67°	48°	3	3.35	3.6	*95*	5.1	2.4	*47.1*	5.7	6.4	*112.3*
219261	do	do	do				2.3							5.7		
226163	do	Southern New Guinea	do					2.85	3.8	*75*	4.85	2.2	*45.4*	5.7	5.9	*103.5*
219262	do	New Guinea	do	8.7				[6] 3.5							6.4	
219264	do	do	do													
219260	do	do	do	8.4											5.6	
Totals				(3) 25.7			(2) 5.3	(3) 9.7	(2) 7.4	(2)	(2) 9.95	(2) 4.6	(2)	(3) 17.1	(4) 24.3	(2)
Averages				*8.57*			*2.65*	*3.23*	*3.7*	*83.8*	*4.98*	*2.3*	*46.2*	*5.7*	*6.08*	*107.9*

NOTE.—For footnotes to reference figures, see p. 104.

TORRES STRAIT (PAPUAN) CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
276077	U. S. N. M.	Torres Strait	Adult	18.4	13.5	13	*73.4*	*81.8*	14.97	1,395	....	6.5	12.8	....	*50.8*	10.3	9.8

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
276077	U. S. N. M.	Torres Strait	Adult	9	67°	42°	....	3.28	3.7	*88.7*	4.9	2.3	*46.9*	5.7	6.4	*112.3*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
276076	U. S. N. M.	Torres Strait	Adult	18.4	11.8	12.9	*64.1*	*85.4*	14.37	1,165	-------	6.6	12.3	-------	*53.7*	10.4	9.8
276080	do	do	do	18	12.2	13.4	*67.8*	*88.7*	14.53	1,220	-------	7.1	12.6	-------	*56.4*	10.7	10.3
276078	do	do	do	17	11.8	12.4	*69.4*	*86.1*	13.73	1,055	-------	7	11.9	-------	*58.8*	10.4	9.7
276079	do	do	do	16.9	12.8	12.5	*75.7*	*83.9*	14.07	1,140	-------	6.3	12.7	-------	*49.6*	10.4	9.7
Totals				(4) 70.3	(4) 48.6	(4) 51.2	(4)	(4)	(4) 56.7	(4) 4,580	-------	(4) 27	(4) 49.5	-------	(4)	(4) 41.9	(4) 39.5
Averages				*17.58*	*12.15*	*12.8*	*69.1*	*86.1*	*14.18*	*1,145*	-------	*6.75*	*12.38*	-------	*54.5*	*10.48*	*9.88*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth, maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°										
276076	U. S. N. M.	Torres Strait	Adult	8.9	66	45	-------	3.2	3.7	*86.5*	4.4	2.4	*54.6*	5.8	5.9	*101.7*
276080	do	do	do	9.6	67.5	55.5	-------	3.6	3.85	*93.5*	4.9	2.3	*46.9*	5.9	6.3	*106.8*
276078	do	do	do	9.1	64.5	53	-------	3.35	3.8	*88.1*	4.55	2.3	*50.5*	6.15	6.2	*100.8*
276079	do	do	do	8.8	66	41	-------	3.4	3.75	*90.7*	4.35	2.5	*57.5*	6.1	6.1	*100*
Totals				(4) 36.4	(4)	(4)	-------	(4) 13.55	(4) 15.1	(4)	(4) 18.2	(4) 9.5	(4)	(4) 23.95	(4) 24.5	(4)
Averages				*9.1*	*66*	*49*	-------	*3.39*	*3.78*	*89.7*	*4.55*	*2.38*	*52.5*	*5.99*	*6.12*	*102.2*

SOLOMON ISLANDS CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
227461	U. S. N. M.	Malaita	Adult	18.6	12.5	13.2	*67.2*	*84.6*	14.77	1,400		6.3	12.6		*50*	10.4	10
227456	do	Guadalcanar	do	18.4	12.5	13.4	*67.9*	*87*	14.77	1,365	[3] 10.6	6.5	13.1	*80.9*	*49.6*	10.1	9.6
227458	do	Savo	do	18.8	12.8	13.6	*68.1*	*86.1*	15.07	1,410		7.5	13.7		*54.7*	10.3	10.1
225129	do		do	18.8	13.7	13.4	*72.9*	*82.2*	15.30	1,370		7.5	14.5		*51.7*	11.8	10.7
227466	do	Malaita	do	19	14	13.8	*73.7*	*83.6*	15.60	1,470		6.95	13.5		*51.5*	10.4	10
Totals				(5) 93.6	(5) 65.5	(5) 67.4	(5)	(5)	(5) 75.51	(5) 7,015		(5) 34.75	(5) 67.4		(5)	(5) 53	(5) 50.4
Averages				*18.72*	*13.1*	*13.48*	*70*	*84.7*	*15.10*	*1,403*		*6.95*	*13.48*		*51.6*	*10.6*	*10.08*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°										
227461	U. S. N. M.	Malaita	Adult	9.2	69	42.5		3.25	3.7	*87.8*	4.8	2.4	*50*	5.5	6.1	*110.9*
227456	do	Guadalcanar	do	9	67	47.5	2.9	3.15	3.85	*81.8*	4.9	2.9	*59.2*	5.8	6.7	*115.5*
227458	do	Savo	do	9	67	52		3.35	4.05	*82.7*	5.2	2.5	*48.1*	5.7	6.8	*119.3*
225129	do		do	10.1	63	38.5	3.5	3.35	4.15	*80.7*	5.5	2.9	*52.7*	6.9	7.2	*104.4*
227466	do	Malaita	do	9	67	49		3.25	4	*81.2*	4.7	2.5	*53.2*	6	6.3	*105*
Totals				(5) 46.3	(5)	(5)	(2) 6.4	(5) 16.35	(5) 19.75	(5)	(5) 25.1	(5) 13.2	(5)	(5) 29.9	(5) 33.1	(5)
Averages				*9.26*	*66.5*	*46.5*	*3.2*	*3.27*	*3.95*	*82.8*	*5.02*	*2.64*	*52.6*	*5.98*	*6.62*	*110.7*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
227457	U. S. N. M.	Malaita	Adult	18	12.4	12.5	*68.9*	*82.2*	14.30	1,210	-------	6.2	12.4	-------	*50*	10.7	9.2

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
227457	U. S. N. M.	Malaita	Adult	9	59°	34.5°	-------	3.1	3.8	*81.6*	4.35	2.75	*63.2*	6.1	6.2	*101.6*

NOTE.—For footnotes to reference figures see p. 104.

NEW HEBRIDES CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
227455	U. S. N. M.	Malliedo	Near adult	18.1	13.4	13.2	*74*	*83.5*	14.90	1,325	[1] 11	6.7	13.1	*84*	*51.2*	11	10.1

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
227455	U. S. N. M.	Malliedo	Near adult	9.4	64.5°	43°	3.5	3.3	3.9	*84.6*	4.6	2.6	*56.5*	5.8	6.6	*113.8*

NEW BRITAIN CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
226113	U. S. N. M.	Gazelle Peninsula	Adult	19.4	13.4	14.7	*69.1*	*89.6*	15.83	1,515	--------	7.2	14	--------	*51.4*	11.2	10.8
226102	do	do	do	18.8	13	13.5	*69.2*	*84.9*	15.10	1,380	--------	6.2	12.7	--------	*48.8*	10.5	10
226108	do	do	do	18.6	13	13.7	*69.9*	*86.7*	15.10	1,295	--------	6.6	13.6	--------	*48.5*	11.4	10.4
226107	do	do	do	19	13.5	14.4	*71*	*88.3*	15.63	1,390	--------	7.3	14.5	--------	*50.3*	11.1	10.5
226103	do	do	do	17.8	12.8	13.2	*71.9*	*86.3*	14.60	1,245	[3] 11.6	7.2	13.5	*85.9*	*53.3*	10.4	9.9
226117	do	do	do	18	13	13	*72.2*	*83.9*	14.67	1,230	--------	6.1	13.1	--------	*46.6*	10	9.6
226097	do	do	do	18	13	12.5	*72.2*	*80.6*	14.50	1,200	--------	6.5	13.2	--------	*49.2*	10.9	9.7
226111	do	do	do	19.4	14.2	14.4	*73.2*	*85.7*	16.00	1,485	--------	6.4	14.5	--------	44.1	9.8	9.7
226118	do	do	do	17.6	12.9	13.4	*73.3*	*87.6*	14.63	1,260	--------	6.4	[2] 13.2	--------	*48.5*	10.5	9.6
226099	do	do	do	18.3	13.5	13.4	*73.8*	*84.3*	15.07	1,390	--------	6.5	13.2	--------	*49.2*	10.5	10.1
226114[3]	do	do	do	17.5	13	13	*74.3*	*85*	14.50	1,010	--------	6.4	13.7	--------	*46.7*	10.2	9.8
226098	do	do	do	18.2	[2] 13.8	12.8	*75.8*	*80*	14.93	[3] 1,310	--------	6.7	13.5	--------	*49.6*	10.4	10.4
226096	do	do	do	18.4	14	12.8	*76.1*	*79*	15.07	1,340	--------	6.7	13.8	--------	*48.6*	10.8	9.8
Totals				(13) 239	(13) 173.1	(13) 174.8	*(13)*	*(13)*	(13) 195.63	17,050	--------	(13) 86.2	(13) 176.5	--------	*(13)*	(13) 137.7	(13) 130.3
Averages				*18.38*	*13.32*	*13.45*	*72.5*	*84.9*	*15.05*	*1,312*	--------	*6.63*	*13.58*	--------	*48.8*	*10.59*	*10.02*
Minima				17.5	12.8	12.5	*69.1*	*79*	14.50	1,010	--------	6.1	12.7	--------	*44.1*	9.8	9.6
Maxima				19.4	14.2	14.7	*76.1*	*89.6*	16.00	1,515	--------	7.3	14.5	--------	*53.3*	11.4	10.8

NOTE.—For footnotes to reference figures see p. 104.

NEW BRITAIN CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle. °	Alv. Angle °	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbis—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
226113	U. S. N. M.	Gazelle Peninsula	Adult	9.8	68	50.5		3.1	3.75	*82.7*	4.9	2.4	*49*	6.5	6.95	*106.9*
226102	do	do	do	9.4	68	50.5		3.2	3.75	*85.3*	4.4	2.6	*59.1*	6	6.4	*106.7*
226108	do	do	do	9.8	64.5	45		3.1	3.75	*82.7*	4.3	2.2	*51.2*	6.3	6.4	*101.6*
226107	do	do	do	9.9	66	56		3.1	3.7	*83.8*	4.8	2.6	*54.2*	6.7	7.25	*108.2*
226103	do	do	do	9	65.5	51	3.6	3.4	3.9	*87.2*	4.75	2.7	*56.8*	6.1	7	*114.8*
226117	do	do	do	8.8	68	49		2.85	3.75	*76*	4.2	2.3	*54.8*	5.7	6.3	*110.5*
226097	do	do	do	9.4	62	42	2.9	3.15	3.9	*80.8*	4.5	2.4	*53.3*	6.2	[3] 6.5	*104.8*
226111	do	do	do	8.4	70.5	46.5		3.15	3.9	*80.8*	4.4	2.4	*54.6*	5.7	6.6	*115.8*
226118	do	do	do	9.2	64	52		3.05	3.85	*79.2*	4.05	2.4	*59.2*	6	6.8	*113.3*
226099	do	do	do	9.2	68.5	39		3.38	3.85	*87.8*	5.05	2.5	*49.5*	5.7	6.55	*114.9*
226114[9]	do	do	do	9	69.5	51		2.9	3.75	*77.3*	4.35	2.6	*59.8*	5.9	6.3	*106.8*
226098	do	do	do	9.4	71	56.5		3.1	[6] 3.8	*81.6*	4.7	[2] 2.5	*53.2*	5.5	6.9	*125.4*
226096	do	do	do	9.5	63	48		3.15	4	*78.7*	4.65	2.6	*55.9*	6	6.7	*111.7*
Totals				(13) 120.8	(13)	(13)	(2) 6.5	(13) 40.63	(13) 49.65	(13)	(13) 59.05	(13) 32.2	(13)	(13) 78.3	(13) 86.65	(13)
Averages				*9.29*	67	*49.5*	*3.25*	*3.12*	*3.82*	*81.7*	*4.54*	*2.48*	*54.6*	*6.02*	*6.66*	*110.6*
Minima				8.4	62	39		2.85	3.7	*76*	4.05	2.2	*49*	5.5	6.3	*101.6*
Maxima				9.9	71	56.5		3.4	4	*87.8*	5.05	2.7	*59.8*	6.7	7.25	*125.4*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
226105	U. S. N. M.	Gazelle Peninsula	Adult	17.4	12.2	12.3	*70.1*	*83.1*	13.97	1,220	10.5	6.6	13.5	*77.8*	*48.9*	10.5	9.6
226116	do	do	do	17.4	12.2	12.2	*70.1*	*82.4*	13.93	1,145		6.3	12.1		*52.1*	10.5	9.4
227465	do		Near adult	16	11.6	12.2	*72.5*	*88.4*	13.27	1,000		5.4	10.9		*49.5*	9.4	9.2
226112	do	Gazelle Peninsula	Adult	17.6	12.8	13.4	*72.7*	*88.2*	14.60	1,300		6.4				9.7	10
227464	do		do	16.5	12	12.4	*72.7*	*86.7*	13.63	1,065		6	11.4		*52.3*	9.6	9.3
226110	do	Gazelle Peninsula	do	17.7	13	13	*73.4*	*84.4*	14.57	1,245		5.9	12.2		*48.4*	9.8	9.4
227454	do		do	16.8	12.4	12.6	*73.8*	*86.3*	13.93	1,155		6.4				9.7	9.5
226115	do	Gazelle Peninsula	do	17	12.6	12.3	*74.1*	*83.1*	13.97	1,065		6.5	12.4		*52.4*	10	9.1
226109	do	do	do	17.2	12.8	13.4	*74.4*	*89.3*	14.47	1,200		6.2	12.7		*48.8*	9.6	9.7
227459	do		do	16.4	12.4	12.4	*75.6*	*86.1*	13.73	1,060		6.1	12.2		*50*	9.6	9.4
226101	do	Gazelle Peninsula	do	17.6	13.4	12.6	*76.1*	*81.3*	14.53	1,220		6.3	13.5		*46.7*	10.5	9.9
Totals				(11) 187.6	(11) 137.4	(11) 138.8	(11)	(11)	(11) 154.6	12,675		(11) 68.1	(9) 110.9		(9)	(11) 108.9	(11) 104.5
Averages				*17.05*	*12.49*	*12.62*	*73.3*	*85.4*	*14.05*	*1,152*		*6.19*	*12.32*		*49.9*	*9.9*	*9.5*
Minima				16	11.6	12.2	*70.1*	*81.3*	13.27	1,000		5.4	10.9		*46.7*	9.4	9.1
Maxima				17.7	13.4	13.4	*76.1*	*89.3*	14.60	1,300		6.6	13.5		*52.4*	10.5	10

NOTE.—For footnotes to reference figures see p. 104.

NEW BRITAIN CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle.	Alv. Angle	Lower Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
					°	°										
226105	U. S. N. M.	Gazelle Peninsula	Adult	9	63.5	44	3	3.1	3.55	*87.3*	4.5	2.4	*53.3*	6	6.7	*111.7*
226116	do	do	do	9.1	62.5	45		3	3.7	*81.1*	4.25	2.3	*54.1*	5.9	6.2	*105.1*
227465	do		Near adult	8.4	71.5	45.5		3.5	3.7	*94.6*	4.1	2.3	*56.1*	5.3	5.9	*111.3*
226112	do	Gazelle Peninsula	Adult	8.6	74	51.5		3.4	4.1	*82.9*	4.6	2.4	*52.2*	5.6	6.2	*110.7*
227464	do		do	8.6	69	50		3.1	3.65	*84.9*	4.45	2.2	*49.4*	5.2	6	*115.4*
226110	do	Gazelle Peninsula	do	8.8	68.5	51.5		3.25	3.7	*87.8*	4.2	2.2	*52.4*	5.5	6	*109.1*
227454	do		do	8.4	69	45.5		3.1	3.45	*89.9*	4.6	2.3	*50*	5.5	6.3	*114.6*
226115	do	Gazelle Peninsula	do	8.8	63	52.5		3	3.7	*81.1*	4.25	2.65	*62.3*	6	6.6	*110*
226109	do	do	do	8.7	72	56		3	3.7	*81.1*	4.4	2.5	*56.8*	5.3	5.9	*111.3*
227459	do		do	8.8	69.5	55		3.4	3.55	*95.8*	4.6	2.4	*52.2*	5.3	5.6	*105.7*
226101	do	Gazelle Peninsula	do	9.2	67	41.5		3.3	4	*82.5*	4.65	2.5	*53.8*	5.9	6.2	*105.1*
				(11)	(11)	(11)		(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
Totals				96.4				35.15	40.8		48.6	26.15		61.5	67.6	
Averages				*8.76*	*68*	*48.5*		*3.2*	*3.71*	*86.2*	*4.42*	*2.38*	*53.9*	*5.59*	*6.14*	*109.9*
Minima				8.4	62.5	41.5		3	3.45	*81.1*	4.1	2.2	*49.4*	5.2	5.6	*105.1*
Maxima				9.2	74	56		3.5	4.1	*95.8*	4.65	2.65	*62.3*	6	6.7	*115.4*

SOUTH SEA ISLAND CRANIA (BLACKS)

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
225154	U. S. N. M.	----------	Adult	19	13	13.9	*68.4*	*86.9*	15.30	1,625	----------	6.8	----------	----------	----------	10.3	10.5

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle.	Alv. Angle	Lower Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
225154	U. S. N. M.	----------	Adult	9.5	72.5°	57.5°	----------	3.4	3.9	*87.2*	5.2	2.6	*50*	5.5	6.6	*120*

SOUTH SEA ISLAND CRANIA (BLACKS)—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
225279	U. S. N. M.		Adult	18.1	12.4	13.3	*68.5*	*86.9*	14.60	1,170		6.6	11.8		*55.9*	10.5	9.9
225156	do		do	17.6	12.2	12.9	*69.3*	*86.6*	14.23	1,245		6.3	11.9		*52.9*	9.5	9.1
Totals				(2) 35.7	(2) 24.6	(2) 26.2	(2)	(2)	(2) 28.83	(2) 2,415		(2) 12.9	(2) 23.7		(2)	(2) 20	(2) 19
Averages				*17.85*	*12.3*	*13.1*	*68.9*	*86.8*	*14.42*	*1,208*		*6.45*	*11.85*		*54.4*	*10*	*9.5*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle.	Alv. Angle	Lower Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
225279	U. S. N. M.		Adult	9.4	66.5°	54°		3.3	3.7	*89.2*	4.5	2.5	*55.6*	5.6		
225156	do		do	8.2	67	47.5	2.65	3.3	3.85	*85.7*	4.3	2.25	*52.3*	5.5	6.2	*112.7*
Totals				(2) 17.6	(2)	(2)		(2) 6.6	(2) 7.55	(2)	(2) 8.8	(2) 4.75	(2)	(2) 11.1		
Averages				*8.8*	*66.5*	*50.5*		*3.3*	*3.78*	*87.3*	*4.4*	*2.38*	*54.1*	*5.55*		

[1] Ornamentation interferes with some of the measurements.
[2] Near.
[3] Teeth in good condition (not worn, or worn but very slightly).
[4] Teeth slightly worn.
[5] Left.
[6] Right.
[7] Painted red.
[8] Teeth moderately worn.
[9] Surely male.

Melanesian crania, summary of measurements

MALES

	South Sea Islands (Blacks)	Torres Straits	Solomon Islands	New Guinea	New Britain	New Hebrides
Number of skulls	(1)	(1)	(5)	(4)	(13)	(1)
Vault:						
Length	----------	----------	18.72	18.78	18.38	----------
Breadth	----------	----------	13.10	13.28	13.32	----------
Height	----------	----------	13.48	13.90	13.45	----------
Cranial Index	----------	----------	*70*	*70.7*	*72.5*	----------
Mean Height Index	----------	----------	*84.7*	*87.2*	*84.9*	----------
Module	----------	----------	15.10	15.27	15.05	----------
Capacity	----------	----------	1,403	1,418	1,312	----------
Face:						
m-n Height	----------	----------	----------	11.2	----------	----------
alv. pt. n	----------	----------	6.95	6.85	6.63	----------
Breadth	----------	----------	13.48	12.9	13.58	----------
Facial Index, Total	----------	----------	----------	*86*	----------	----------
Facial Index, Upper	----------	----------	*51.6*	*52.7*	*48.8*	----------
Basion-alveolar pt. length	----------	----------	10.60	----------	10.59	----------
Basion-nasion pt. length	----------	----------	10.08	9.97	10.02	----------
Basion-subnasal pt. length	----------	----------	9.26	8.93	9.29	----------
Facial angle (degrees)	----------	----------	*66.5*	----------	*67*	----------
Alveolar angle (degrees)	----------	----------	*46.5*	----------	*49.5*	----------
Orbits:						
Mean height	----------	----------	3.27	3.40	3.12	----------
Mean breadth	----------	----------	3.95	3.97	3.82	----------
Mean Index	----------	----------	*82.8*	*85.7*	*81.7*	----------
Nose:						
Height	----------	----------	5.02	4.88	4.54	----------
Breadth	----------	----------	2.64	2.68	2.48	----------
Index	----------	----------	*52.6*	*54.9*	*54.6*	----------
Dental arch:						
Length	----------	----------	5.98	----------	6.02	----------
Breadth	----------	----------	6.62	6.68	6.66	----------
Index	----------	----------	*110.7*	----------	*110.6*	----------
Lower Jaw: Height at Symphises	----------	----------	3.2	3.2	3.25	----------

FEMALES

	South Sea Islands (Blacks)	Torres Straits	Solomon Islands	New Guinea	New Britain	New Hebrides
Number of skulls	(2)	(4)	(1)	(6)	(11)	
Vault:						
Length	17.85	17.58	----------	17.30	17.05	----------
Breadth	12.30	12.15	----------	12.70	12.49	----------
Height	13.10	12.80	----------	13.02	12.62	----------
Cranial Index	*68.9*	*69.1*	----------	*73.4*	*73.3*	----------
Mean Height Index	*86.8*	*86.1*	----------	*87.5*	85.4	----------
Module	14.42	14.18	----------	14.26	14.05	----------
Capacity	1,208	1,145	----------	1,191	1,152	----------
Face:						
m-n Height	----------	----------	----------	----------	----------	----------
alv. pt. n	6.45	6.75	----------	----------	6.19	----------
Breadth	11.85	12.38	----------	11.64	12.32	----------
Facial Index, Total	----------	----------	----------	----------	----------	----------
Facial Index, Upper	*54.4*	*54.5*	----------	----------	*49.9*	----------
Basion-alveolar pt. length	10	10.48	----------	----------	9.9	----------
Basion-nasion pt. length	9.50	9.88	----------	9.72	9.5	----------
Basion-subnasal pt. length	8.80	9.10	----------	8.57	8.76	----------
Facial angle (degrees)	*66.5*	*66*	----------	----------	*68*	----------
Alveolar angle (degrees)	*50.5*	*49*	----------	----------	*48.5*	----------
Orbits:						
Mean Height	3.30	3.39	----------	3.23	3.20	----------
Mean Breadth	3.78	3.78	----------	3.70	2.71	----------
Mean Index	*87.3*	*89.7*	----------	*88.8*	*86.2*	----------
Nose:						
Height	4.40	4.55	----------	4.98	4.42	----------
Breadth	2.38	2.38	----------	2.3	2.38	----------
Index	*54.1*	*52.3*	----------	*46.2*	*53.9*	----------
Dental Arch:						
Length	5.55	5.99	----------	5.70	5.59	----------
Breadth	----------	6.12	----------	6.08	6.14	----------
Index	----------	*102.2*	----------	----------	*109.9*	----------
Lower Jaw: Height at Symphises	----------	----------	----------	2.65	3.2	----------

NOTES ON THE MELANESIANS

The series of this group, except that of New Britain, are too small for any definite conclusions; nevertheless they offer some fairly good indications.

It is plain that the Melanesians are not strictly homogeneous, though the differences are not great.

In general, the crania of this group are of moderate to small size; the sexual characters are ill defined; the vault is decidedly narrow and often relatively high; the face is rather weak, more or less prognathic; the orbits are not high, the nose is moderately broad, the dental arch relatively large.

SOUTH AFRICAN BUSHMEN

BUSHMEN CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
1624	R. C. S.		Adult	18.5	12.7	[1] 12.5	*68.6*	*80.1*	14.57		6.6	12.6		*52.4*	[1] 9.9	[1] 9.8
1300–12	do.		do.	18.6	13	13	*69.9*	*82.3*	14.87	[2] 11	[a] 6.5	12.8	*85.9*	*50.8*	9.6	9.8
[b] 20	C. T. U.	Between Fish and Kowie Rivers.	do.	18.1	12.9	12.6	*71.3*	*81.3*	14.53		6.3	13.3		*47.4*	9.7	10.3
10	do.	Southeast Cape Coast	do.	17.6	12.9	12.8	*73.3*	*84.2*	14.43	10.5	6.3	12.6	*83.3*	*50*	10	10.1
1303–1	R. C. S.		do.	18.8	13.8	12.1	*73.4*	*74.2*	14.90		6.4	12.4		*51.6*	9.5	9.8
1303–7	do.		Adolescent	19	14	12.6	*73.7*	*76.4*	15.20		5.35	12		*44.6*		
1300–15	do.		Adult	18.4	13.7	12.6	*74.5*	*78.8*	14.90	[5] 11.2	[c] 6.5	12.2	*91.8*	*53.3*	9.3	9.3
[d] 29	C. T. U.		do.	17.8	13.3	12.5	*74.7*	*80.1*	14.53			[1] 12.4				9
1145	S. A. M.	Krysna Cave	do.	18.4	13.8	12.9	*75*	*80.1*	15.09	10.2	5.9	12.4	*82.3*	*47.6*	8.7	9.4
[e] 18	C. T. U.	Sand dunes of Hout Bay	do.	18	13.6	12.6	*75.6*	*79.8*	14.73		7.1	12.3		*57.7*	10.1	9.8
1303	R. C. S.		do.	18.5	14	13.4	*75.7*	*82.7*	15.30	(6)		13.3				10.4
1303–3	do.		do.	18.2	13.8	12.7	*75.8*	*79.4*	14.90		6.8	11.9		*57.1*	10	9.3
21	C. T. U.	Between Fish and Kowie Rivers.	do.	18.6	14.2	13.1	*76.3*	*79.9*	15.30			[1] 13.4				9.8
[f] 1300	R. C. S.		do.	17.4	13.4	12.8	*77*	*83.1*	14.53	(7)		12				9.3
[g] 1878	S. A. M.	Roeberg Krysne	do.	18	14.4	13	*80*	*80.2*	15.13	[8] 10.3	6.4	12.6	*81.8*	*50.8*	9.8	9.6
Totals				(15) 273.9	(15) 203.5	(15) 191.2	(15)	(15)	(15)	(5) 53.20	(11) 70.15	(15) 188.2	(5)	(11)	(10) 96.6	(14) 135.7
Averages				*18.26*	*13.57*	*12.75*	*74.3*	*80.1*	*14.86*	*10.64*	*6.38*	*12.55*	*85*	*51.2*	*9.66*	*9.69*
Minima				17.4	12.7	12.1	*68.6*	*74.2*	14.43	10.2	5.35	11.9	*81.8*	*44.6*	8.7	9
Maxima				19	14.4	13.4	*80*	*84.2*	15.30	11.2	7.1	13.4	*91.8*	*57.7*	10.1	10.4

NOTE.—For footnotes to reference figures see p. 113. For footnotes to reference letters see p. 108.

BUSHMEN CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
1624	R. C. S.		Adult	8.8	[a] 69.5	[a] 54		2.95	3.7	*79.7*	[9] 4.55	2.85	*62.6*	5.6	7.1	*126.8*
1300-12	do		do	8.6	72	55	3.1	[h] 3.3	3.75	*88*	[9] 4.6	2.4	*52.2*	5.2	6.4	*123.1*
[b] 20	C. T. U.	Between Fish and Kowie Rivers.	do	8.9	77	54		[i] 3.05	3.65	*83.6*	[9] 4.95	2.6	*52.5*	5.1	6.3	*123.5*
10	do	Southeast Cape Coast	do	9	72.5	52.5	3	3	3.6	*83.3*	[10] 4.6	2.4	*52.2*	5.6	6.2	*110.7*
1303-1	R. C. S.		do	8.8	73	61.5		3.08	3.85	*80*	[9] 4.75	2.45	*51.6*	5	5.9	*118*
1303-7	do		Adolescent													
1300-15	do		Adult	8.3	70	56.5	3.3	[h] 3.05	3.65	*83.6*	[9] 4.4	2.25	*51.1*	5.3	6.5	*122.6*
[d] 29	C. T. U.		do	7.6				3.1	3.65	*84.9*	[9] 4.4	2.95	*67*			
1145	S. A. M.	Krysna Cave	do	7.7	78	46.5	3.2	2.82	3.6	*78.3*	[9] 4.65	[j] 2.8	*60.2*	4.8	6.2	*129.2*
[e] 18	C. T. U.	Sand dunes of Hout Bay	do	9	67	56.5		2.9	3.65	*79.5*	[9] 4.75	2.35	*49.5*	5.4	5.9	*109.3*
1303	R. C. S.		do	9.1				2.95	3.78	*78*	4.85	[k] 2.95	*60.8*			
1303-3	do		do	8.8	64	49		3.1	3.65	*84.9*	[9] 4.9	2.45	*50*	5.5	[l] 7.1	*129.1*
21	C. T. U.	Between Fish and Kowie Rivers.	do	8.6				3.22	3.65	*88.2*	[10] 4.6	2.8	*60.9*			
[f] 1300	R. C. S.		do	8				2.82	3.7	*76.2*	[10] 4.4	2.9	*65.9*			
[g] 1878	S. A. M.	Rosberg, Krysna	do	8.6	69	48	[m] 2.9	[1] 3.4	3.78	*90*	[10] 4.6	2.45	*53.3*	5.6	6.2	*110.7*
Totals				(14) 119.8	(10)	(10)	(5) 15.5	(14) 42.74	(14) 51.66	(14)	(14) 65	(14) 36.6	(14)	(10) 53.1	(10) 63.8	(10)
Averages				*8.56*	*71*	*53.5*	*3.1*	*3.05*	*3.69*	*82.7*	*4.64*	*2.61*	*56.3*	*5.31*	*6.38*	*120.2*
Minima				7.6	64	46.5	2.9	2.82	3.6	*76.2*	4.4	2.25	49.5	4.8	5.9	*109.3*
Maxima				9.1	78	61.5	3.3	3.4	3.85	*90*	4.95	2.95	*67*	5.6	7.1	*129.2*

[a] Lateral incisors shovel-shaped, medians slightly.
[b] Known in life.
[c] Lateral upper incisors shovel-shaped, medians slightly.
[d] Female-like; skeleton though small is decidedly male.
[e] Surely male.
[f] Sex questionable.
[g] Somewhat marked signs in orbits of symmetric osteoporosis.
[h] Marked infraorbital notch.
[i] Inter-dacryon diameter = 3.4.
[j] Slight intranasal shelves.
[k] Moderate intranasal shelves.
[l] Alveolar process swollen externally, both sides.
[m] Rather marked infraorbital notch, each side.

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
[a] 23	S. A. M.		Adult	18.4	13.3	12.6	*72.3*	*79.8*	14.77						9.3	10.1
2	do		do	17	12.4	12	*72.9*	*81.6*	13.80		5.7	12.2		*46.7*	9.5	9.6
[a] 1300-17	R. C. S.		do	17.2	12.6	12.3	*73.3*	*82.6*	14.03	[b] 10.9	6.6	12	*90.8*	*55*	9.5	9.4
1451	S. A. M.	Krysna Cave	do	17.1	13		*76*			9.5	5.35	11.8	*80.5*	*45.3*		
12	do		do	17.5	13.6	12.2	*77.7*	*78.2*	14.43		5.6	12.4		*45.2*	9.6	9.5
A	do	Sand dune, Mussel Bay	do	17.1	13.5	12.3	*79*	*80.4*	14.30	[b] 9.4	5.7	11.3	*83.2*	*50.4*	8.9	8.7
Totals				(6) 104.3	(6) 78.4	(5) 61.4	(6)	(5)	(5)	(3) 29.8	(5) 28.95	(5) 59.7	(3)	(5)	(5) 46.8	(5) 47.3
Averages				*17.38*	*13.07*	*12.28*	*75.2*	*80.5*	*14.27*	*9.93*	*5.79*	*11.94*	*84.9*	*48.5*	*9.36*	*9.46*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b\times100}\right)$
[a] 23	S. A. M.		Adult	8.6	°	°		[12] 3.1	[1, 11] 3.9	*79.5*	[9] 4.5	[1] 2.8	*62.2*			
[a] 2	do		do	8.6	74	54		3.1	3.75	*82.7*	[10] 4.1	2.5	*61*	5.1	5.8	*113.7*
[a] 1300-17	R. C. S.		do	8.3	69	52	[b] 2.9	[1] 3	3.4	*88.2*	4.5	2.6	*57.8*	5.6	5.9	*105.4*
1451	S. A. M.	Krysna Cave	do				3	3.25	3.6	*90.3*	4	2.4	*60*	4.8	5.8	*120.8*
12	do		do	8.5	72	41		3	3.52	*85.2*	[9] 4.35	2.7	*62.1*	5.1	6	*117.6*
A	do	Sand dune, Mussel Bay	do	8	69	57.5	3.1	3.1	3.35	*92.6*	[9] 3.8	2	*52.6*	4.9	5.3	*108.2*
Totals				(5) 42	(4)	(4)	(3) 9	(6) 18.55	(6) 21.52	(6)	(6) 25.25	(6) 15	(6)	(5) 25.5	(5) 28.8	(5)
Averages				*8.4*	*73.5*	*51.5*	*3*	*3.09*	*3.59*	*86.1*	*4.21*	*2.5*	*59.4*	*5.1*	*5.76*	*112.9*

[a] Sex questionable. [b] Marked infraorbital notch. NOTE.—For footnotes to reference figures see p. 113.

HOTTENTOT

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	*Cranial Module*	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
1296	R. C. S.		Adult	18.6	13	13.8	*69.9*	*87.3*	15.13	[13] 11.3	6.4	13.8	*81.9*	*46.4*	11.3	10.7
1303-6	do		do	18.8	13.6	13.2	*72.3*	*81.5*	15.20		6.2	13.1		*47.3*	10.1	10.2
1268	S. A. M.	Orange River	do	18.2	13.2	13	*72.5*	*82.8*	14.80	[a] [2] 10.5	6	12.7	*82.7*	*47.2*	9.8	9.6
[b] 14	do		do	18.6	13.9	13.2	*74.7*	*81.5*	15.23		7.1	13		*54.6*	9.9	10.4
Totals				(4) 74.2	(4) 53.7	(4) 53.2	(4)	(4)	(4)	(2) 21.8	(4) 25.7	(4) 52.6	(2)	(4)	(4) 41.1	(4) 40.9
Averages				*18.55*	*13.42*	*13.3*	*72.4*	*83.2*	*15.09*	*10.9*	*6.42*	*13.15*	*82.3*	*48.8*	*10.28*	*10.22*

Catalogue No. [a]	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°										
1296	R. C. S.		Adult	10	68	47	3.7	3.12	4.2	*74.3*	[9] 4.5	2.65	*58.9*	6.1	6.5	*106.6*
1303-6	do		do	9.4	73	63		[c] [1] 3.1	3.7	*83.8*	[10] 4.45	2.65	*59.5*	5.2	[1] 6.3	*121.2*
1268	S. A. M.	Orange River	do	8.8	70.5	49	3.2	2.95	3.48	*84.8*	[10] 4.5	2.6	*57.8*	5.5	6.6	*120*
[b] 14	do		do	9	73.5	62		3.2	3.78	*84.6*	4.7	2.65	*56.4*	5.7	6.7	*117.5*
Totals				(4) 37.2	(4)	(4)	(2) 6.9	(4) 12.37	(4) 15.16	(4)	(4) 18.15	(4) 10.55	(4)	(4) 22.5	(4) 26.1	(4)
Averages				*9.3*	*71.5*	*55.5*	*3.45*	*3.09*	*3.79*	*81.5*	*4.54*	*2.64*	*58.1*	*5.62*	*6.52*	*116*

[a] Upper left lateral incisor markedly shovel-shaped, medians trace. Slight infraorbital notch, right, moderate left. Characters in general those of the negro.
[b] Identification questionable.
[c] Marked infraorbital notch.

NOTE.—For footnotes to reference figures see p. 113.

HOTTENTOT—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
30	S. A. M.	Namaqualand	Adult	18.4	• 13.4	12.7	*72.8*	*79.9*	14.83	[2] 10.7	6.3	12.6	*84.9*	*50*	9.2	9.7
10	do	do	do	17.1	13	12.2	*76*	*81.3*	14.10	[8] 11	6.5	12.7	*86.6*	*51.2*	9.5	9.4
31	do	do	do	17.8	13.6	12	*76.4*	*76.4*	14.47	[8] 10.4	6.7	12.4	*83.9*	*54*	9.1	9.4
29	do	do	do	17.2	13.8	12.1	*80.2*	*78.1*	14.37	[14] 10.7	6.7	12.2	*87.7*	*54.9*	9.3	9
Totals				(4) 70.5	(4) 53.8	(4) 49	(4)	(4)	(4)	(4) 42.8	(4) 26.2	(4) 49.9	(4)	(4)	(4) 37.1	(4) 37.5
Averages				*17.62*	*13.45*	*12.25*	*76.3*	*78.8*	*14.44*	*10.7*	*6.55*	*12.48*	*85.7*	*52.5*	*9.28*	*9.38*

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°										
30	S. A. M	Namaqualand	Adult	8.4	75	53.5	3.3	3.12	3.65	*85.5*	[9] 4.95	2.8	*56.6*	4.9	6.1	*124.5*
10	do	do	do	8.6	69	57.5	3.2	3.3	3.65	*90.4*	[a,10] 4.65	2.55	*54.8*	5	6.3	*126*
31	do	do	do	8.4	71.5	61	2.75	[b] 3.3	3.6	*91.7*	[9] 4.95	2.55	*51.5*	4.9	5.8	*118.4*
29	do	do	do	8.2	66	54	3.2	3.1	3.7	*83.8*	[10] 4.6	2.55	*55.4*	5.2	5.7	*109.6*
Totals				(4) 33.6	(4)	(4)	(4) 12.45	(4) 12.82	(4) 14.6	(4)	(4) 19.15	(4) 10.45	(4)	(4) 20	(4) 23.9	(4)
Averages				*8.4*	*70.5*	*57*	*3.11*	*3.2*	*3.65*	*87.7*	*4.79*	*2.61*	*54.5*	*5*	*5.98*	*119.6*

[a] Inter-dacryon diameter = 2.9.

[b] Defects, not marked, of lower orbital border, as in the negroes.

1 Near.
2 Teeth in good condition (not worn or worn but very slightly).
3 Teeth nearly in good condition.
4 About.
5 Teeth medium worn (more than moderate).
6 Incisors missing.
7 Absorption of alveolus.
8 Teeth somewhat worn.
9 Lower border distinct.
10 Lower border nearly distinct.
11 Approximate.
12 Right.
13 Teeth moderately worn.
14 Teeth slightly worn.
15 Left.
16 Right.

SOUTH AFRICAN NEGROES

SOUTH AFRICAN NEGRO CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
1255	S. A. M.	Mahalanga, Southern Rhodesia.	Adult	19.5	13	13	*66.7*	*80.2*	15.17	[3] 11.7	6.8	13.1	*89.3*	*51.9*	10.4	10.2
3052	do	Swakopmund	do	19	12.7	12.4	*66.8*	*78.5*	14.70		7.3	13.6		*53.7*	10.7	10.2
1464	do	Damaraland	do	18.1	12.2	13.1	*67.4*	*86.2*	14.47	[14] 11.9	6.9	12.9	*92.2*	*53.5*	9.7	10.1
3476	do	Ovambo	do	18.6	12.6	12.8	*67.7*	*82*	14.67		7.3	[1] 13.7		*53.3*	10.8	10.4
155	do		do	19.9	13.5	13.9	*67.8*	*83.2*	15.77	[3] 11.8	7	12.8	*92.2*	*54.7*	10	10
1868	do	"Southwest Protectorate"	do	20.2	13.9	12.6	*68.8*	*74.1*	15.57		6.9	13.2		*52.3*	10	10.2
* 25	do		do	19.2	13.2	13.8	*68.8*	*85.2*	15.40	[3] 11.2	6.4	13.3	*84.2*	*48.1*	11.2	10.9
(*)	Dr. Drennan's	"Cape"	do	21.3	14.7	14.5	*69*	*80.6*	16.83	12.4	7.3	14	*88.6*	*52.1*	11.2	11.4
3036	S. A. M.	Ovambo	do	18.8	13	13.9	*69.2*	*87.4*	15.23		7	13.5		*51.8*	9.7	10.6
3035	do	Ovamboland	do	18.9	13.1	14	*69.3*	*87.5*	15.33	[14] 11.9	7.3	14	*85*	*52.1*	11.7	10.8
3473	do	Ovambo	do	19	13.2	14.3	*69.5*	*89.4*	15.50		7.5	[1] 13.6		*55.2*	10.3	11
168	do		do	18.7	13	13.9	*69.5*	*88*	15.20		7.6	13.5		*56.3*	11.1	10.5
3477	do	Ovambo	do	19	13.3	13.4	*70*	*82.7*	15.23		7	13		*53.8*	11	10.8
3493	do	do	do	19.1	13.4	13.1	*70.2*	*80.9*	15.20							10.3
3489	do	do	do	19.2	13.5	13.4	*70.3*	*81.7*	15.37			[1] 14				10.5

26	C. T. U	Near Mafeking	do	19.8	14	13.2	70.7	78.1	15.67		6	12.9		46.5	9.8	10
31	do		do	19.4	13.8	13.4	71.1	80.7	15.53		7				10.2	10.4
14	S. A. M	Damara	do	18.5	13.2	12.8	71.4	81	14.83		6.9	13.4		51.5	10.3	10.3
153	do		do	19.9	14.2	14.1	71.4	82.9	16.07		7	14.6		47.9	11.3	10.9
[d] 3490	do	Ovambo	do	18.2	13	13	71.4	83.3	14.73							9.7
3041	do	Ovamboland	do	18.2	13.1	13.5	72	86.5	•14.93		7.8	13		60	10.3	10.2
3694	do		do	20.1	14.5	13.6	72.1	78.6	16.07		6.7	[1] 14.1		47.5	10.6	10.4
• 1465	do	Damaraland	do	17.8	12.9	13.6	72.5	88.3	14.77	[2] 11.5	6.6	13.8	83.3	47.8	10.4	10.1
3483	do	Ovambo	do	19	14	13.7	73.7	83	15.57			12.8				10.3
3037	do	do	do	18.5	13.8	13.8	74.6	85.2	15.37	[3] 11.7	[1] 7.1	13	90	54.6	10.3	10.6
3739d	do	do	do	18.6	13.9	13.4	74.7	82.7	15.30							10.7
• 1866	do	Salisbury, Northern Rhodesia.	do	18.2	13.7	13.3	75.3	83.1	15.07	[3] 11.6	7.1	12.9	89.9	55	9.9	10.1
3467	do	Ovambo	do	18	13.6	13.4	75.6	84.8	15		6.9	13.1		52.7	10.3	10.4
1884	do	Mashona	do	18.5	14	13.6	75.7	84	15.37							10
3038	do	Ovambo	do	17.8	13.5	14	75.8	89.7	15.10	[13] 11.2	6.7	13.4	83.6	50	10.1	10.4
12	do	Bechuana	Near adult	19.3	14.9	13.8	77.2	80.7	16		6.7	12.9		51.9	10.5	10.8
16	C. T. U		Adult	17.7	13.8	12.8	78	81	14.77		6.4	12.3		52	9.3	9.6
• 3	S. A. M	Fire River	do	18.6	14.6	13.6	78.5	81.9	15.60	[2] 11.4	6.7	12.7	89.8	52.8	10.2	10.2
Totals				(34) 643.6	(34) 460.2	(34) 457.9	(34)	(34)	(34)	(11) 128.3	(28) 194.9	(29) 386.9	(11)	(27)	(28) 292.2	(34) 353.7
Averages				18.93	13.54	13.47	71.5	82.9	15.31	11.66	6.96	13.34	87.9	52.2	10.44	10.4
Minima				17.7	12.2	12.4	66.7	74.1	14.47	11.2	6	12.3	83.3	46.5	9.3	9.6
Maxima				21.3	14.9	14.5	78.5	89.7	16.83	12.4	7.8	14.6	92.2	60	11.7	11.4

NOTE.—For footnotes to reference figures see p. 113. For footnote to reference letters see p. 117.

SOUTH AFRICAN NEGRO CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°										
1255	S. A. M.	Mahalanga, Southern Rhodesia.	Adult	9.1	69	48.5	3.5	3.55	4	*88.7*	[9]4.8	2.7	*56.2*	5.6	6.5	*116.1*
3052	do	Swakopmund	do	9.5	66	50.5		3.38	3.9	*86.7*	[9]5.3	2.85	*53.8*	5.8	6.8	*117.2*
1464	do	Damaraland	do	8.6	73	53.5	3.3	3.38	3.7	*91.4*	[9]4.9	2.65	*54.1*	5.1	6.7	*131.4*
3476	do	Ovambo	do	9.2	68	42		3.02	3.55	*85.1*	[9]5.3	3.15	*59.4*	6.3	7.6	*120.6*
155	do		do	8.9	69.5	58	3.7	3.3	3.8	*86.8*	[f]4.55	2.9	*63.7*	5.9	6.1	*103.4*
1868	do	"Southwest Protectorate"	do	9.2	72	61		2.92	3.75	*77.9*	[9]4.95	2.55	*51.5*	5.3	6.5	*122.6*
[8]25	do		do	10.3	71	52.5	3.6	3.38	3.85	*87.8*	[9]4.9	3	*61.2*	5.9	6.9	*117*
(b)	Dr. Drennan's	"Cape"	do	10.2	73	55.5	3.6	3.22	4	*80.5*	[10]5.4	3.15	*58.3*	6.1	7.2	*118*
3036	S. A. M.	Ovambo	do	8.7	77	59		3.3	3.7	*89.2*	[9]4.8	2.5	*52.1*	5.3	6.7	*126.4*
3035	do	Ovamboland	do	10.3	64.5	52.5	3.8	3.35	3.35	*100*	4.75	2.85	*60*	6.3	6.9	*109.5*
3473	do	Ovambo	do	9.6	74.5	66.5		3.4	3.8	*89.5*	5.1	2.45	*48*	5.7	7.3	*128.1*
168	do		do	9.6	65.5	51.5		3.42	3.75	*91.2*	[f]4.95	3.85	*77.8*	6.4	6.6	*103.1*
3477	do	Ovambo	do	9.8	70	56		3.5	3.9	*89.7*	4.6	2.95	*64.1*	6	7.2	*120*
3493	do	do	do													
3489	do	do	do	9.7				3.38	3.85	*87.8*	[9]5	3.1	*62*			
[8]166	do	Kowie	do	9.8	69.5	56		3.4	3.9	*87.2*	[f]4.75	3.05	*64.2*	5.7	6.7	*117.5*

26	C. T. U	[Near] Mafeking	do	8.9	74.5	58		3.28	3.6	*91.1*	4.5	2.75	*61.1*	5.9	6	*101.7*
31	do		do	9.4	72	60		3.4	3.9	*87.2*	[g] 5.2	2.8	*53.8*	5.2	6.8	*130.8*
14	S. A. M	Damara	do	9.5	70.5	63	4.1	3.25	3.75	*86.7*	4.7	2.8	*59.6*	5.6	6.5	*116.1*
183	do		do	10	68.5	50	3.65	3.05	3.8	*80.3*	[h] 4.9	2.9	*59.2*	6.2	7.3	*117.7*
[d] 3490	do	Ovambo	do					3.28	3.8	*86.3*	[i] 4.9	2.8	*57.1*			
3041	do	Ovamboland	do	9	67	54		3.5	3.7	*94.6*	[g] 5.2	2.6	*50*	5.9	6.6	*111.9*
3094	do		do	9.5	70	53		3.38	4.2	*80.5*	[h] 4.75	2.8	*59*			
[e] 1465	do	Damaraland	do	9	69	47	[1] 3.5	3.35	3.7	*90.5*	[f] 4.55	2.75	*60.4*	5.9	6.6	*111.9*
3483	do	Ovambo	do	9				3.42	3.9	*87.7*	4.9	2.55	*52*			
3037	do	do	do	9.2	72.5	57	3.6	3.4	3.78	*90*	[g] 4.8	2.9	*60.4*	[1] 5.6	6.5	*116.1*
3739d	do	do	do													
1866	do	Salisbury, Northern Rhodesia	do	9.2	70.5	65	3.5	3.25	3.62	*89.8*	[f] 4.95	2.75	*55.6*	5.3	6.4	*120.8*
[a] 3467	do	Ovambo	do	9.4	71.5	57.5		3.62	3.75	*96.5*	[g] 5.05	2.7	*53.5*	5.7	6.8	*119.3*
1884	do	Mashona	do					[10] 3.2	[10] 3.7	*86.5*						
3038	do	Ovambo	do	8.8	73.5	51.5	[1] 3.4	3.38	3.68	*91.9*	[i, g] 4.55	2.7	*59.3*	5.6	6.1	*108.9*
12	do	Bechuana	Near adult	9.8	74	64		[1] 3.35	3.95	*84.8*	4.8	2.55	*53.1*	5.7	6.8	*119.3*
16	C. T. U		Adult	8.6	73	64		3.25	3.75	*86.7*	4.3	2.5	*58.1*	5.2	6.4	*123.1*
[c] 3	S. A. M	Fire River	do	9.2	71	51	3.3	3.08	3.85	*80*	[g] 5.1	2.75	*53.9*	5.6	6.3	*112.5*
Totals				(30) 281	(28)	(28)	(13) 46.55	(32) 106.34	(32) 121.23	(32)	(31) 151.2	(31) 87.3	(31)	(27) 154.8	(27) 180.8	(27)
Averages				*9.37*	*70.5*	*55.5*	*3.58*	*3.32*	*3.79*	*87.6*	*4.88*	*2.82*	*57.8*	*5.73*	*6.7*	*116.9*
Minima				8.6	64.5	42	3.3	2.92	3.35	*77.9*	4.3	2.45	*48*	5.1	6	*101.7*
Maxima				10.3	77	66.5	4.1	3.62	4.2	*100*	5.4	3.85	*77.8*	6.4	7.6	*131.4*

[a] Kaffir; whole skeleton.
[b] "Boskop-like."
[c] Kaffir.
[d] Sex questionable.
[e] Surely male.
[f] Moderate intranasal shelves.
[g] Medium intranasal shelves.
[h] Asymmetrical.
[i] Slight intranasal shelves.

NOTE.—For footnotes to reference figures see p. 113.

SOUTH AFRICAN NEGRO CRANIA—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
3739c	S. A. M.	Ovambo	Adult	18.7	12.6	12.9	67.4	82.7	14.73							10
3479	do	do	do	18	12.5	12.9	69.4	84.9	14.47		5.9	12		49.2	9.7	9.8
3470	do	do	do	17.6	12.4	12.4	70.4	82.7	14.13		6.6	12.3		53.7	10.1	9.5
3475	do	do	do	17.5	12.4	13.3	70.9	88.7	14.40		6.5	12.1		53.7	9.9	9.7
3739a	do	do	do	17.9	12.7	12.8	71	83.7	14.47							10.2
[a] 1867	do	Near Salisbury Northern Rhodesia.	do	18.9	13.5	12.8	71.4	79	15.07		[1] 6.8	12.4		54.8	[4] 10.4	10.2
3471	do	Ovambo	do	18	12.9	12.6	71.7	81.8	14.50		6.8	12.6		54	9.6	8.8
3494	do		do	18.4	13.2	12.4	71.7	78.5	14.67							10.1
3739b	do	Ovambo	do	18.4	13.2	13	71.7	82.3	14.87							
[b] 3481	do	do	do	18.1	13	13.6	71.8	87.2	14.90		7	12		58.3	9.7	9.6
3492	do	do	do	17.6	12.7	13.4	72.2	88.2	14.57		6.3	12.2		51.6	9.5	9.9
1463	do	Damaraland	do	18.3	13.3	13.6	72.7	86.1	15.07			12.6				9.7
3478	do	Ovambo	do	16.7	12.2	12.7	73	88.2	13.87		6.3	12.3		51.2	10.1	10
1869	do	Herero South West Africa	do	17.8	13	12.9	73	83.8	14.57	[13] 10.3	6.6	12.5	82.4	52.8	10.5	10.1
3486	do	Ovambo	do	17.3	12.7	13	73.4	86.7	14.33		6.2	[1] 12		51.7	9.4	9.7
3040	do	do	do	18.1	13.3	12.9	73.5	82.2	14.77		6.85	12.4		55.2	10.3	9.9
3491	do	do	do	17.9	13.2	13.4	73.7	85.9	14.83		6.5	12.2		53.3	9.3	9.3
3469	do	do	do	17.8	13.2	12.8	74.2	82.6	14.60		[1] 7	12.8		54.7	[1] 10.3	10
[b] 3487	do	do	do	19	14.1	12.8	74.2	77.1	15.30		6.7	13.4		50	9.5	9.5
[b] 3488	do	do	do	18	13.4	14	74.4	89.2	15.13		6.8	12.8		53.1	10.3	10.4
3468	do	do	do	17.6	13.1	12.9	74.4	83.8	14.53		6	12.9		46.5	9.1	9.4
3484	do	do	do	17.7	13.3	13.6	75.1	87.7	14.87		6.6				10.3	9.9
3480	do	do	do	16.8	12.7	12.4	75.6	83.8	13.97		[1] 6.2	[1] 12.4		50	[1] 9.2	9.1
3482	do	do	do	17.3	13.1	12.4	75.7	81.6	14.27		6.4	11.8		54.2	9.5	9.5
[b] 3472	do	do	do	17.6	13.4	13.9	76.1	89.7	14.97		6.8	13.1		51.9	10.7	10.4
3485	do	do	do	17.4	13.4	13.1	77	85.1	14.63		6.5	12.4		52.4	[1] 9.3	9.2
Totals				(26) 464.4	(26) 338.5	(26) 338.5	(26)	(26)	(26)	10.3	(21) 137.35	(21) 261.2		(20)	(21) 206.7	(25) 243.9
Averages				17.86	13.02	13.02	72.9	84.3	14.63		6.54	12.44		52.6	9.84	9.76
Minima				16.7	12.2	12.4	67.4	77.1	13.87		5.9	11.8		46.5	9.1	8.8
Maxima				19	14.1	14	77	89.7	15.30		7	13.4		58.3	10.7	10.4

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle °	Alv. Angle °	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
3739c	S. A. M.	Ovambo	Adult													
3479	do	do	do	8.7	73.5	53		3.25	3.5	*92.9*	[10] 4.2	2.6	*61.9*	5.4	6.4	*118.5*
3470	do	do	do	8.9	66	53		2.95	3.6	*81.9*	[9] 4.4	2.8	*63.6*	5.7	6.4	*112.3*
3475	do	do	do	8.7	69	54		3.15	3.62	*87*	[9] 4.2	2.45	*58.3*	5.6	6.3	*112.5*
3739a	do	do	do													
[a] 1867	do	Near Salisbury Northern Rhodesia.	do	9.3	69	53.5	[1] 3.2	3.62	3.65	*99.2*	[10] 4.8	2.75	*57.3*			
3471	do	Ovambo	do	8.2	62	49		3.05	3.48	*87.6*	[9] 4.5	2.85	*63.3*	5.6	6.9	*123.2*
3494	do		do													
3739b	do	Ovambo	do													
[b] 3481	do	do	do	8.2	68	46.5		3.28	3.6	*91.1*	[9] 4.8	2.9	*60.4*	5.7	6.6	*115.8*
3492	do	do	do	8.8	74.5	61.5		3.18	3.62	*87.8*	[9] 4.55	2.6	*57.2*	5.5	6.1	*110.9*
1463	do	Damaraland	do	9				3.18	3.5	*90.8*	[9] 4.4	2.65	*60.2*	[1] 5.9	6.4	*108.5*
3478	do	Ovambo	do	8.9	71	50.5		3	3.5	*85.7*	4.4	2.5	*56.8*	5.4	5.9	*109.3*
1869	do	Herero South West Africa	do	9.2	68.5	50.5	[1] 2.7	[1] 3.5	3.9	*89.7*	[10] 4.5	2.85	*63.3*	5.6	[1] 6.1	*108.9*
3486	do	Ovambo	do	8.6	74	56.5		3.5	3.55	*98.6*	[9] 4.65	2.55	*54.8*	[1] 5	6	*120*
3040	do	do	do	9	67.5	48	3.5	3.38	3.65	*92.6*	[10] 4.9	2.6	*53.1*	5.8	6	*103.4*
3491	do	do	do	8.4	69.5	57.5		3	3.75	*80*	[9] 4.5	2.95	*65.6*	5.3	6.5	*122.6*
3469	do	do	do	8.9	67.5	48.5		3.6	3.8	*94.7*	[9] 4.85	2.85	*58.8*	[1] 5.8	6.8	*117.2*
[b] 3487	do	do	do	8.4	69.5	50.5		3.38	3.8	*88.9*	[9] 4.9	2.9	*59.2*	5.6	6.5	*116.1*
[b] 3488	do	do	do	9	72	49.5		3.62	[1] 3.8	*95.3*	[10] 4.85	2.6	*53.6*	5.8	6.4	*110.3*
3468	do	do	do	8.2	74	56		3.25	3.7	*87.8*	[10] 4.3	2.5	*58.1*	5.4	6.7	*124.1*
3484	do	do	do	9.1	68	52		[1] 3.2	3.55	*90.1*	4.5	2.6	*57.8*	5.7	6.2	*108.8*
3480	do	do	do	8.2	70	52		3.1	3.6	*86.1*	4.5	2.9	*64.4*	[1] 5.7	6.5	*114*
3482	do	do	do	8.6	70	57.5		3.45	3.55	*97.2*	[9] 4.55	2.7	*59.3*	5.2	6.2	*119.2*
[b] 3472	do	do	do	9.2	69	46.5		3.38	3.7	*91.4*	4.65	2.9	*62.4*	6	7.1	*118.3*
3485	do	do	do	8.4	68.5	57		3.08	3.3	*93.4*	[10] 4.55	2.55	*56*	[1] 5.3	5.9	*111.3*
Totals				(22) 191.9	(21)	(21)	(3) 9.4	(22) 72.1	(22) 79.72	(22)	(22) 100.45	(22) 59.55	(22)	(21) 117	(21) 133.9	(21)
Averages				*8.72*	*69.5*	*52*	*3.13*	*3.28*	*3.62*	*90.6*	*4.56*	*2.71*	*59.4*	*5.57*	*6.38*	*114.5*
Minima				8.2	62	46.5	2.7	2.95	3.3	*80*	4.2	2.45	*53.1*	5	5.9	*103.4*
Maxima				9.3	74.5	61.5	3.5	3.62	3.9	*99.2*	4.9	2.95	*65.6*	6	7.1	*124.1*

[a] Zygomae malelike, mastoids semi-malelike, but other features female.

[b] Surely male.

NOTE.—For footnotes to reference figures see p. 113.

Comparison of measurements

MALE

Group	No.	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-NasionHeight (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
Bushmen	(15)	18.26	13.57	12.75	*74.3*	*80.1*	14.86	10.64	6.38	12.55	*85*	*51.2*	9.66	9.69
Hottentot	(4)	18.55	13.42	13.3	*72.4*	*83.2*	15.09	10.9	6.42	13.15	*82.3*	*48.8*	10.28	10.22
South African Negro	(34)	18.93	13.54	13.47	*71.5*	*82.9*	15.31	11.66	6.96	13.34	*87.9*	*52.2*	10.44	10.4

Group	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
		°	°										
Bushmen	8.56	71	53.5	3.1	3.05	3.69	*82.7*	4.64	2.61	*56.3*	5.31	6.38	*120.2*
Hottentot	9.3	71.5	55.5	3.45	3.09	3.79	*81.5*	4.54	2.64	*58.1*	5.62	6.52	*116*
South African Negro	9.37	70.5	55.5	3.58	3.32	3.79	*87.6*	4.88	2.82	*57.8*	5.73	6.7	*116.9*

FEMALE

Group	No.	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
Bushmen	(6)	17.38	13.07	12.28	*75.2*	*80.5*	14.27	9.93	5.79	11.94	*84.9*	*48.5*	9.36	9.46
Hottentot	(4)	17.62	13.45	12.25	*76.3*	*78.8*	14.44	10.7	6.55	12.48	*85.7*	*52.5*	9.28	9.38
South African Negro	(26)	17.86	13.02	13.02	*72.9*	*84.3*	14.63	[a] (10.3)	6.54	12.44	[a] *(82.4)*	*52.6*	9.84	9.76

Group	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
Bushmen	8.4	[a] 73.5	[a] 51.5	3	3.09	3.59	*86.1*	4.21	2.5	*59.4*	5.1	5.76	*112.9*
Hottentot	8.4	70.5	57	3.11	3.2	3.65	*87.7*	4.79	2.61	*54.5*	5	5.98	*119.6*
South African Negro	8.72	69.5	52	[b] 3.13	3.28	3.62	*90.6*	4.56	2.71	*59.4*	5.57	6.38	*114.5*

[a] Could be measured in one skull only.

[b] In two skulls only.

Bushmen, Hottentots, and South African negroes contrasted

(Both sexes taken together)

	Cranial Index		Mean Height Index		Cranial Module		Facial Index, Upper		Facial Angle		Orbital Index		Nasal Index		Index of the Upper Dental Arch	
Bushmen	(21)	74.6	(20)	80.2	(20)	14.71	(16)	50.4	(14)	72	(20)	83.7	(20)	57.2	(15)	117.8
Hottentots	(8)	74.4	(8)	81	(8)	14.76	(8)	50.6	(8)	71	(8)	84.6	(8)	56.3	(8)	117.8
S. A. Negro	(60)	72.1	(60)	83.5	(60)	15.01	(47)	52.4	(49)	70	(54)	88.8	(53)	58.5	(48)	115.9

SOUTH AFRICAN BUSHMEN, HOTTENTOTS, NEGROES

The material of these series leaves much to be desired, particularly in the cases of the Hottentot and the Bushmen. Such as it is, however, it gives the following indications:

The Bushmen show extensive variation in the cephalic index (males, 68.6–80), in the upper facial index (males, 44.6–57.7), in the orbital index (males, 76.2–90), and in the nasal index (males, 49.5–65.9).

The vault is decidedly low.

The size of the head is small.

The face is small.

The orbits are prevalently low, the nose broad.

The "palate" (dental arch) is short and relatively broad, giving high index.

HOTTENTOTS

In every item the eight Hottentots that could be measured give average values so close to those of the Bushmen that no clear distinction of the two is possible. So far as these series are concerned, we are obviously confronted by one basic type only and that, in the Bushman, probably a degenerate rather than a pure racial type.

The series of specimens in this group is rather fair and shows well the main characteristics of the group.

The skull of the South African (Bantu) negro differs, though on the whole not really greatly, from that of the Bushman and Hottentot. It is more uniform. It is longer, so that the cephalic index is somewhat lower; the vault is somewhat higher; the skull as a whole is a little larger, but this is discounted by the greater stature and mass of the negro; the face is higher and more prognathic; the orbits are higher, the nose and palate somewhat broader than in the Bushman and Hottentot.

When studied more in detail, nevertheless, the two strains—that is, the Bushmen and Hottentot on one side and the negro on the other—show decided and important relations.

NEGROES (AFRICAN AND AMERICAN)

(BRITISH) EAST AFRICA NEGRO CRANIA

MALE

• Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
257588	U. S. N. M.	Nairobi	Adult	18.8	12.9	12.6	68.6	79.8	14.77	1,265	------	6.8	12.5	------	54.4	10.8	9.9
257591	do	do	do	18.6	12.8	12.5	68.8	79.6	14.63	1,320	------	6.7	------	------	------	9.9	9.7
257540	do	Fort Hall	do	18.5	13.1	13.4	70.8	84.8	15.00	1,460	------	7.6	12.9	------	58.9	10.5	10.6
273201	do	Sagalla	do	18.6	13.3	13.2	71.5	82.5	15.03	1,350	------	6.9	------	------	------	9.9	9.8
257595	do	Nairobi	do	18.6	13.3	12.9	71.5	80.6	14.93	1,430	------	7	12.9	------	54.3	10	9.9
257589	do	do	do	18.3	13.2	13.6	72.1	86.1	15.03	1,425	------	6.7	------	------	------	10.3	10.1
257546	do	Fort Hall	do	18.3	13.2	13.4	72.1	84.8	14.97	1,450	------	6.9	12.8	------	53.9	9.5	10
273204	do	Near Sagalla	do	18.7	13.5	13.1	72.2	81.4	15.10	1,355	------	[1] 6.9	13.3	------	51.9	[1] 9.7	9.9
257579	do	Nairobi	do	17.9	13	13	72.6	84.4	14.63	1,400	------	[1] 6.5	[1] 12.9	------	50.4	[1] 9.9	10.2
257596	do	do	do	18.4	13.4	13.7	72.8	86.2	15.17	1,470	------	7.2	13.1	------	55	11.1	10.6
273207	do	Near Sagalla	do	19	13.9	13.6	73.2	82.9	15.50	1,550	------	7.9	13.6	------	58.1	10.1	10.3
257594	do	Near Naivasha	do	18.6	13.7	13.1	73.7	80.9	15.13	1,310	------	7	[1] 13.3	------	52.6	10.2	10
257582	do	Nairobi	do	17.3	13.8	13	79.8	83.5	14.70	1,340	------	------	------	------	------	------	9.9
257597	do	do	Near adult	17.4	13.9	13.8	79.9	88.5	15.03	1,490	------	6.85	12.4	------	55.2	9.8	10.2
Totals				(14) 257	(14) 187	(14) 184.9	(14) ------	(14) ------	(14) 209.62	(14) 19,615	------	(13) 90.95	(10) 129.7	------	(10) ------	(13) 131.7	(14) 141.1
Averages				18.36	133.6	13.21	72.8	83.3	14.97	1,401	------	7	12.97	------	54.5	10.13	10.08
Minima				17.3	12.8	12.5	68.6	79.6	14.63	1,265	------	6.5	12.4	------	50.4	9.5	9.7
Maxima				19	13.9	13.8	79.9	88.5	15.50	1,550	------	7.9	13.6	------	58.9	11.1	10.6

[1] Near.
[2] Right.
[3] Left.
[4] Short.
[5] Teeth moderately worn.
[6] Teeth in good condition (not worn or but very slightly worn).
[7] Teeth much worn.
[8] Teeth slightly worn.
[9] About.

(BRITISH) EAST AFRICA NEGRO CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle.	Alv. Angle	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°									
257588	U. S. N. M.	Nairobi	Adult	9.2	64	46	3.3	3.8	*86.8*	4.4	2.8	*63.6*	6.3	6.1	*96.8*
257591	do	do	do	8.7	69	52	3.4	[3] 3.8	*89.5*	4.6	2.7	*58.7*	5.7	6.6	*115.8*
257540	do	Fort Hall	do	8.8	69.5	44.5	3.48	4	*87*	5.3	2.7	*50.9*	5.9	6.8	*116.2*
273201	do	Sagalla	do	8.7	68.5	53	3.4	[3] 3.8	*89.5*	4.7	2.4	*51.1*	5.6		
257595	do	Nairobi	do	9	69	58.5	3.35	3.68	*91*	4.7	2.5	*53.2*	5.5	6.4	*116.4*
257589	do	do	do	9.1	69.5	51.5	3.35	3.75	*89.3*	4.7	2.5	*53.2*	5.7	6.35	*111.4*
257546	do	Fort Hall	do	8.5	73	55.5	[3] 3.1	[3] 3.5	*88.6*	4.95	2.8	*56.6*	[1] 5.4	6.3	*116.7*
273204	do	Near Sagalla	do	8.6	71	51	3.35	3.7	*90.5*	5.1	2.9	*56.9*			
257579	do	Nairobi	do	9	74	56.5	3.2	3.8	*84.2*	4.7	2.6	*55.3*	[1] 5.4	6.4	*118.5*
257596	do	do	do	10	67	51	3.45	3.8	*90.8*	5.35	2.9	*54.2*	6.1	6.7	*109.8*
273207	do	Near Sagalla	do	9	68.5	54.5	3.35	4	*83.7*	5.78	2.9	*50.2*	5.75		
257594	do	Near Naivasha	do	8.6	68	46.5	3.22	3.85	*83.6*	4.65	2.6	*55.9*	5.8	5.9	*101.7*
257582	do	Nairobi	do				[3] 3	[3] 3.8	*79*				(4)	7.4	
257597	do	do	Near adult	8.5	73	51	3.2	3.85	*83.1*	4.75	2.8	*59*	5.6	6.7	*119.6*
Totals				(13) 115.7	(13)	(13)	(14) 46.15	(14) 53.13	(14)	(13) 63.68	(13) 35.1	(13)	(12) 68.75	(11) 71.65	(10)
Averages				*8.9*	*69.5*	*51*	*3.3*	*3.79*	*87.1*	*4.9*	*2.7*	*55.1*	*5.73*	*6.51*	*111.9*
Minima				8.5	64	44.5	3	3.5	*79*	4.4	2.4	*50.2*	5.4	5.9	*96.8*
Maxima				10	74	58.5	3.48	4	*91*	5.78	2.9	*63.6*	6.3	7.4	*119.6*

NOTE.—For footnotes to reference figures see p. 123

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
257542	U. S. N. M.	Nyeri	Near adult	18.4	12.4	13	*67.4*	*84.4*	14.60	1,360	* 10.9	6.5	12.2	*89.3*	*53.3*	10	10
273202	do	Near Sagalla	Adult	17.3	11.8	11.9	*68.2*	*81.5*	13.67	1,145			[1] 11.5				8.8
257586	do	Nairobi	do	18.2	12.6	12.3	*69.2*	*79.9*	14.37	1,155							9.8
257584	do	do	do	18	12.6	11.7	*70*	*76.5*	14.10	1,090		6.5	[1] 13		*60*	9.9	9.3
257574	do	Nyiro River	do	17.9	12.6	12.4	*70.4*	*81*	14.30	1,270		7.2				8.9	9.5
257549	do	Fort Hall	do	17.6	12.4	12.9	*70.4*	*88*	14.30	1,275		5.7	[1] 11.9		*47.9*	10	9.8
273206	do	Sagalla	do	18.3	13	(11.7)	*71*		(14.33)	1,285		6.4	[1] 12.8		*50*	10.1	9.9
273200	do	Near Sagalla	do	17.4	12.4	12.6	*71.3*	*84.6*	14.13	980		7.2	12.1		*59.5*	10.6	10
257587	do	Nairobi	do	18.2	13	12.5	*71.4*	*80.1*	14.57	1,350		7.1	12.7		*55.9*	10.3	9.7
257544	do	Fort Hall	do	[1] 18.2	13.1	13	*72*	*83.3*	14.77								
273203	do	Sagalla	do	17.6	12.8	12.6	*72.7*	*82.9*	14.33	1,330		7	[1] 13.3		*52.6*	10.2	10.1
257548	do	Nyeri	Senile	18	13.2	12.4	*73.3*	*79.5*	14.53	1,320		6.9				10.5	10.8
257583	do	Nairobi	Adult	18	13.2		*73.3*										
273205	do	Near Sagalla	do	18	13.2	13.4	*73.3*	*85.9*	14.87	1,360		6.3	12.7		*49.6*	11.2	9.9
257599	do	Nairobi	do	17.8	13.1	12.8	*73.6*	*83.1*	14.57	1,220		[1] 6.8				[1] 10.2	10.8
257581	do	Near Naivasha	do	17.6	13.1	13	*74.4*	*84.4*	14.57	1,165		[1] 6.5	12.7		*51.2*	[1] 9.8	9.9
257590	do	Nairobi	do	18.2	13.6	12.5	*74.7*	*78.6*	14.77	1,290			(12.6)				9.8
257578	do	do	Near adult	17.6	13.2	13	*75*	*84.4*	14.60	1,185		6.5	12.2		*53.3*	9.7	10.1
257592	do	do	Adult	17.6	13.2	12.5	*75*	*81.2*	14.43	1,285		6.2				9.8	9.6
257547	do	Nyeri	do	17.8	13.4	12.8	*75.3*	*82*	14.67	1,380		6.2	12.4		*50*	9.6	9.5
273199	do	Near Sagalla	do	17.5	13.2	12.1	*75.4*	*78.6*	14.27	1,240		[1] 6				9.8	9.4
273198	do	do	do	16.4	12.4	12	*75.6*	*83.3*	13.60	1,060		5.9	12.6			9.4	8.9
257600	do	Nairobi	Near adult	17.1	13	12	*76*	*80*	14.03	1,170		[1] 6.3				[1] 9	9.4
257576	do	do	Adult	17.5	13.4	[1] 11.4	*76.6*	*74*	14.10	1,195							
257598	do	do	do	17.2	13.2	12.1	*76.7*	*79.6*	14.17	1,220							9.2
257545	do	Fort Hall	Near adult	17.7	13.6	13.4	*76.8*	*85.9*	14.90	1,370		6.1	12.2		*50*	9.8	9.8
257585	do	Nairobi	do	17.2	13.7	11.8	*79.6*	*76.6*	14.23	1,350		6.8	12.6		*54*	9.8	9.1
257573	do	do	Adult	17.6		12.7											9.9
				(28)	(27)	(26)	(27)	(25)	(25)	(25)		(20)	(15)		(14)	(20)	(25)
Totals				495.9	350.4	324.8			359.45	31,050		130.1	186.9			198.6	242.5
Averages				*17.71*	*12.98*	*12.49*	*73.3*	*81.5*	*14.38*	*1,242*		*6.5*	*12.46*		*51.7*	*9.93*	*9.7*
Minima				16.4	11.8	11.4	*67.4*	*74*	13.60	980		5.7	11.5		*47.9*	8.9	8.8
Maxima				18.4	13.7	13.4	*79.6*	*86*	14.90	1,380		7.2	13.3		*59.5*	11.2	10.8

* Height of lower jaw at symphysis about 2.9.

NOTE.—For footnotes to reference figures see p. 123.

(BRITISH) EAST AFRICA NEGRO CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle.	Alv. Angle	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°									
257542	U. S. N. M.	Nyeri	Near adult	8.7	71	48	3.3	3.7	*89.2*	4.6	2.8	*60.9*	5.4	6.5	*120.4*
273202	do	Near Sagalla	Adult	8.4			3.4	3.75	*90.7*	4.5	2.2	*48.9*		58	
257586	do	Nairobi	do												
257584	do	do	do	8.7	65	40	3.42	4.1	*83.4*	4.75	2.9	*61.1*	5.8	6.2	*106.9*
257574	do	Nyiro River	do	8	71.5	58	[3] 3.2			5.15	2.3	*44.7*	4.7	5.9	*125.5*
257549	do	Fort Hall	do	9.2	71.5	55.5	3.25	3.55	*91.6*	4.2	2.15	*51.2*	5.2	5.9	*113.5*
273206	do	Sagalla	do	9.1	70	50.5	3.3	4.05	*81.5*	4.8	3	*62.5*	5.5	6.5	*118.2*
273200	do	Near Sagalla	do	9.1	65.5	48.5	3.35	3.65	*91.8*	4.8	2.7	*56.2*	(6.1)		
257587	do	Nairobi	do	9	65	50.5	3.15	3.65	*86.3*	4.9	2.6	*53.1*	5.8		
257544	do	Fort Hall	do												
273203	do	Sagalla	do	9.3	69	61.5	3.18	4	*79.5*	4.7	2.55	*54.3*	5.6	6.5	*116.1*
257548	do	Nyeri	Senile	9.6	73.5	52.5	3.5	4	*87.5*	5.4	2.8	*51.8*			
257583	do	Nairobi	Adult										5.6	6.4	*114.3*
273205	do	Near Sagalla	do	9.8	61.5	43	3.2	3.75	*85.3*	4.4	2.9	*65.9*	6.3	6.5	*103.2*
257599	do	Nairobi	do	9.2	71.5	57	3.08	3.7	*86.8*	4.7	2.6	*55.3*	[1] 5.5	6.1	*110.9*
257581	do	Near Naivasha	do	8.8	71.5	54.5	3.25	3.7	*87.8*	4.65	2.45	*52.7*	5.6		
257590	do	Nairobi	do				[3] 3.2	3.6	*88.9*	4.6	2.7	*58.7*		6.5	
257578	do	do	Near adult	8.4	74.5	46.5	3.3	[3] 3.7	*89.2*	4.75	2.7	*56.8*	5.4	6.1	*118*
257592	do	do	Adult	8.6	70	44	[3] 3.35	[3] 3.55	*94.4*	4.65	2.4	*51.6*			
257547	do	Nyeri	do	8.5	70.5	51	3.28	3.68	*89.1*	4.4	2.55	*57.9*	5.2	5.6	*107.7*
273199	do	Near Sagalla	do	8.8	68	52.5	[3] 3.35	3.55	*94.4*	4.25	2.5	*58.8*	5.3	5.7	*107.6*
273198	do	do	do	8.4	67	54.5	3.3	3.5	*94.3*	4	2.5	*62.5*	5.2	5.7	*109.6*
257600	do	Nairobi	Near adult	8.4	73.5	62	3.33	3.6	*92.5*	4.75	2.6	*54.7*	[1] 4.6	5.9	*128.3*
257576	do	do	Adult												
257598	do	do	do												
257545	do	Fort Hall	Near adult	8.7	72	52	3.25	3.65	*89*	4.3	2.5	*58.1*	5.2	6.3	*121.2*
257585	do	Nairobi	do	8.3	63.5	46.5	3.25	3.68	*88.3*	4.5	2.5	*55.6*	5.5	6.8	*123.6*
257573	do	do	Adult												
Totals				(21) 185	(20)	(20)	(22) 72.19	(21) 78.11	(21)	(22) 101.75	(22) 56.9	(22)	(18) 97.4	(18) 110.9	(16)
Averages				8.81	*69.5*	*51.5*	*3.28*	*3.72*	*88.3*	*4.62*	*2.59*	*55.9*	*5.41*	*6.16*	*114.6*
Minima				8	61.5	43	3.08	3.5	*79.5*	4	2.15	*44.7*	4.6	5.6	*103.2*
Maxima				9.8	74.5	62	3.5	4.1	*94.4*	5.4	3	*65.9*	6.3	6.8	*128.3*

NOTE.—For footnotes to reference figures see p. 123

SOUTH AFRICA NEGRO (KAFFIR) CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
• 263197	U. S. N. M.	Port Alfred, Cape of Good Hope.	Adult	18.8	13	13.6	*69.2*	*85.5*	15.13	1,390	[5] 11.5	6.7	13.3	*86.5*	*50.4*	10.9	10.3
263199	do	do	do	19.6	14.1	13.8	*71.9*	*82.1*	15.83	1,515	[6] 11.5	6.8	13.3	*86.5*	*51.1*	10.6	10.7
263200	do	do	do	19.1	14	13.8	*73.3*	*83.1*	15.63	1,495	[5] 12	7.2	13.2	*90.9*	*54.6*	10.4	10.3
• 263198	do	do	do	17.9	13.6	13	*76*	*82.3*	14.83	1,270	[7] 10.8	6.5	12.6	*85.7*	*51.6*	10.1	9.5
244053	do	Zambezi	do	17.8	13.6	13.8	*76.4*	*87.9*	15.07	1,295		6.5	12.6			9.6	9.5
• 263196	do	Port Alfred, Cape of Good Hope.	do	18.1	14.6	12.6	*80.7*	*76.8*	15.10	1,450	[8] 9.6	5.6	12.2	*78.7*	*45.9*	[1] 9.4	9.3
Totals				(6) 111.3	(6) 82.9	(6) 80.6	(6)	(6)	(6) 91.59	(6) 8,415	(5) 55.4	(6) 39.3	(6) 77.2	(5)	(6)	(6) 61	(6) 59.6
Averages				*18.55*	*13.82*	*13.43*	*74.6*	*83*	*15.26*	*1,402*	*11.08*	*6.55*	*12.87*	*85.7*	*50.9*	*10.17*	*9.93*

NOTE.—For footnotes to reference figures see p. 123. For footnotes to reference letters see p. 128.

SOUTH AFRICA NEGRO (KAFFIR) CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle.	Alv. Angle	Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
[c] 263197	U. S. N. M.	Port Alfred, Cape of Good Hope.	Adult	9.6	67	47.5	3.6	3	4	*75*	4.75	2.55	*53.7*	[1] 6.1	6.9	*113.1*
263199	do	do	do	9.6	72.5	48.5	3.4	[1] 3.2	3.7	*86.5*	5.35	2.9	*54.2*	5.5	6.5	*118.2*
263200	do	do	do	9.5	69	61	3.8	3.05	3.7	*82.4*	4.9	2.6	*53.1*	5.6	5.8	*103.6*
[b] 263198	do	do	do	8.7	66	47.5	3.8	3.05	3.7	*82.4*	4.35	2.8	*64.4*	[1] 5.6	6.3	*112.5*
244053	do	Zambezi	do	8.8	69.5	56.5	------	3.4	3.7	*91.9*	4.9	2.4	*49*	5.4	6.1	*113*
[a] 263196	do	Port Alfred, Cape of Good Hope.	do	8.6	71.5	51	2.75	3.1	3.5	*88.6*	4.3	2.7	*62.8*	[1] 4.9	6	*122.4*
Totals				(6) 54.8	(6) ------	(6) ------	(5) 17.35	(6) 18.8	(6) 22.3	(6) ------	(6) 28.55	(6) 15.95	(6) ------	(6) 33.1	(6) 37.6	(6) ------
Averages				*9.13*	*69*	*52.5*	*3.47*	*3.13*	*3.72*	*84.1*	*4.76*	*2.66*	*55.9*	*5.52*	*6.27*	*113.6*

[a] 263196 and 263200 Kaffir convicts.

[b] Surely male.

[c] Femalelike, especially lower jaw, but pelvis is male.

WEST AFRICA NEGRO CRANIA

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
244052	U. S. N. M.	Gold Coast	Adult	18.2	13.1	13.9	*72*	*89.1*	15.07	1,345	* 11.7	6.7	12.7	*92.1*	*52.8*	10	10.3
244051	do.		do.	18.3	13.3	13.7	*72.7*	*86.7*	15.10	1,390		6.7	12.8		*52.3*	10.9	10.5
278001	do.		do.	18.1	13.2	13.1	*72.9*	*84*	14.80	1,330		6.3	[1] 12.1		*52.1*	10.5	10
276348	do.	South Cameroon	do.	18.4	13.7	14.4	*74.5*	*90*	15.50	1,420		6.5	13.6		*47.8*	11	10.9
244055	do.	Upper Guinea	do.	17.6	13.4	13.2	*76.1*	*85.2*	14.73	1,430		6.8	12.6		*54*	9.7	9.5
300484	do.	Cameroon	do.	17.9	13.9	13.2	*77.6*	*85*	15.00	1,365		7	14		*50*	11.3	10.6
302767	do.	French Congo	do.	16.8	13.2	13.6	*78.6*	*90.7*	14.53	1,240		7	13.6		*51.2*	10.6	10.1
Totals				(7) 125.3	(7) 93.8	(7) 95.1	(7)	(7)	(7) 104.73	(7) 9,520		(7) 47	(7) 91.4		(7)	(7) 74	(7) 71.9
Averages				*17.9*	*13.4*	*13.58*	*74.8*	*86.8*	*14.96*	*1,360*		*6.71*	*13.06*		*51.4*	*10.57*	*10.27*

* Height of lower jaw at symphysis = 3.9.

NOTE.—For footnotes to reference figures see p. 123.

WEST AFRICA NEGRO CRANIA—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b\times100}{l}\right)$
					°	°									
244052	U. S. N. M.	Gold Coast	Adult	8.5	73.5	50.5	2.98	3.7	*80.5*	4.32	2.6	*60.2*	5.8	6.3	*108.6*
244051	do		do	9.7	69	47	3.4	3.95	*86.1*	4.95	3	*60.6*	5.8	7	*120.7*
270691	do		do	9.4	68	54	3.1	4	*77.5*	4.25	2.8	*65.9*	5.7	(6)	*(105.3)*
276348	do	South Cameroon	do	10	72	57.5	3.5	4	*87.5*	4.35	2.7	*62.1*	------	------	------
244055	do	Upper Guinea	do	8.4	68	52	3	3.6	*83.3*	4.5	2.7	*60*	5.1	------	------
209434	do	Cameroon	do	10	66	49.5	3.65	3.8	*96*	4.8	2.9	*60.4*	6	6.4	*106.7*
302767	do	French Congo	do	9.3	66.5	49.5	3.2	3.85	*83.1*	4.9	2.7	*55.1*	5.6	5.8	*121.4*
Totals				(7) 65.3	(7)	(7)	(7) 22.83	(7) 26.9	(7)	(7) 32.07	(7) 19.4	(7)	(6) 34	(4) 25.5	(4)
Averages				*9.33*	*69*	*51*	*3.26*	*3.84*	*84.9*	*4.58*	*2.77*	*60.5*	*5.67*	*6.38*	*114.2*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
244057	U. S. N. M.	Guinea	Adult	17.4	11.8	13.2	*67.8*	*90.4*	14.13	1,180		6.7	12.3		*54.5*	10	9.8
244056	do	Congo	do	17.6	13.4		*76.1*										
276089	do		do	16.4	12.5	12.8	*76.2*	*88.9*	13.90	1,170		7.1	12		*59.2*	9.7	9.3
276090	do		do	16.8	13	12.5	*77.4*	*83.9*	14.10	1,180		[1] 5.9	11.7		*50.4*	[1] 8.9	9.1
209435	do	Cameroon	do	17.6	13.8		*78.4*			1,380	(a)	6.5	12.7		*51.2*		
276088	do		do	17	13.4	12.6	*78.8*	*82.9*	14.33	1,160		[1] 6.6	13.2		*50*	[1] 10.3	9.7
276093	do		do	15.8	12.8	12.6	*81*	*88.1*	13.73	1,020	(b)	6.3	12.1		*52.1*	9.9	9.1
Totals				(7) 118.6	(7) 90.7	(5) 63.7	(7)	(5)	(5) 70.19	(6) 7,090		(6) 39.1	(6) 74		(6)	(5) 48.8	(5) 47
Averages				*16.94*	*12.96*	*12.74*	*76.5*	*86.7*	*14.04*	*1,182*		*6.52*	*12.33*		*52.9*	*9.76*	*9.4*

[a] Height of lower jaw at symphysis about 2.4.

[b] Height of lower jaw at symphysis=2.8.

NOTE.—For footnotes to reference figures see p. 123.

WEST AFRICA NEGRO CRANIA—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
					°	°									
244057	U. S. N. M.	Guinea	Adult	8.4	68.5	46	3.1	3.5	*88.6*	4.4	2.6	*59.1*	5.5	6.9	*125.4*
244056	do	Congo	do												
276089	do		do	8.5	65	51.5	3.6	[3] 3.8	*94.7*	5	2.4	*48*	5.5	[1] 6	*109.1*
276090	do		do	8	72.5	51.5	3.1	3.75	*82.7*	4.4	2.3	*52.3*	[1] 5	5.6	*112*
209435	do	Cameroon	do				3.5	4.1	*85.4*	4.65	2.5	*53.8*			
276068	do		do	9.4	66	55.5	3.3	3.65	*90.4*	4.85	2.6	*53.6*	[1] 5.5		
276093	do		do	8.4	64	42.5	3.3	3.6	*91.7*	4.35	2.7	*62.1*	5.4		
Totals				(5) 42.7	(5)	(5)	(6) 19.9	(6) 22.4	(6)	(6) 27.65	(6) 15.1	(6)	(5) 26.9	(3) 18.5	(3)
Averages				*8.54*	*67*	*49*	*3.32*	*3.73*	*89*	*4.61*	*2.52*	*54.7*	*5.38*	*6.17*	*115.8*

NOTE.—For footnotes to reference figures see p. 123.

AMERICAN NEGRO CRANIA (FULL-BLOOD) [a]

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Naison (y)
[b] 248635	U. S. N. M.	Washington	Adult	(19.8)	(12.9)	(13.4)	(65.2)	(81.7)	15.37	1,250		7.9	12.4		63.7	10.7	10.7
225105	do	Richmond	do	19.8	13.3	14.2	67.2	85.5	15.77	1,460		[1] 7.3				[1] 11.4	10.9
[b] 244066	do	do	do	(19.1)	(12.9)	(13.4)	(67.5)	(83.8)	15.13	1,335	[5] 12.2	[9] 6.8	13	93.8	52.3	[1] 10.3	10.3
[c] 244079	do		50	18.4	12.6	13.8	68.5	89	14.93	1,350	10.7	6.1	12.8	83.6	47.7	9.9	9.9
225107	do	Washington	Senile	18.6	12.9	13.1	69.4	82.9	14.87	1,295			12.8				10.9
248639	do	do	28	18	(12.8)		(71.1)				[6] 11.4	6.7	12.2	93.4	54.9	10.9	9.7
225226	do		70	18.8	13.4	13.4	71.3	83.2	15.20	1,350	[7] 11.4	6.9				11.1	10.4
244060	do	Richmond	Adult	18.8	13.4	13.4	71.3	83.2	15.20	1,415		[1] 6.8	13.6		50	[1] 10.6	10.4
248337	do	Washington	do	19.6	14	12.1	71.4	72	15.23	1,330		7.3	13.5		54.1	[1] 11	10.3
244088	do	Richmond	do	18.6	13.4	12.8	72	80	14.93	1,165		[1] 6.6	12.9		51.2	[1] 10.4	10.2
244068	do	do	do	18.7	13.5	12.2	72.2	75.8	14.80	1,200	[6] 12.7	7.9	13.3	95.5	59.4	10.5	10.4
244065	do	do	45	19.8	14.3	13	72.2	76.5	15.70	1,410	[5] 12.9	7.8	14	92.1	55.7	11.2	10.5
248674	do	Washington	Adult	18.5	13.4	13.7	72.4	85.6	15.20	1,335	[6] 11.5	6.8	12.8	89.8	53.1	10.1	10.3
244074	do	do	55	19	13.8	14.1	72.6	86	15.63	1,460	[5] 12.6	7.3	12.6	100	57.9	10.8	10.6
225108	do	Richmond	Adult	19	13.8	13.9	72.6	84.8	15.57	1,550		6.9	13.3		51.9	10.5	10.6
248646	do	Washington	35	17.6	12.8		72.7					6.6	12.4		53.2	10.1	9.7
324589	do	Havana, Cuba	Adult	18.4	13.4	13.8	72.8	86.8	15.20	1,465	[6] 9.5	5.7	12.2	77.9	46.7	10	10.4
244059	do	Richmond	do	19.1	14	13	73.3	78.3	15.37	1,335		6.7	13		51.5	11.1	10.3
248638	do	Washington	do	18.5	13.6		73.5				[6] 11.9	7	13.8	86.2	50.7	10.5	10.4
226125	do		do	19	14	13.2	73.7	80	15.40	1,365		6.9	13.8		50	10.7	10.3
244067	do	Richmond	45	19	14	13.6	73.7	82.4	15.53	1,525		[1] 6.9	13.2		52.3	[1] 10.4	10.1
225151	do		Adult	17.9	13.2	13.9	73.7	89.1	15.00	1,380			[1] 13.1				9.4
244072	do	Richmond	do	18.7	13.9	14.2	74.3	87.1	15.60	1,320		7.5	14		53.6	10.3	10.8
225257	do	Near Vicksburg, Miss.	About 75	18.5	13.8	12.4	74.6	76.5	14.90	1,200			13.2				10.5
244085	do	Alabama	Adult	18.1	13.5	14.4	74.6	91.1	15.33	1,435		7	13		53.8	11.1	10.9

NOTE.—For footnotes to reference figures see p. 123. For footnotes to reference letters see p. 134.

AMERICAN NEGRO CRANIA (FULL-BLOOD—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°										
[b] 248635	U. S. N. M.	Washington	Adult	9.3	68.5	49		3.5	4	*87.5*	5.75	2.6	*45.2*	5.9	6.7	*113.6*
225105	do	Richmond	do	10.1	67	48		3.65	3.95	*92.4*	5.35	2.4	*44.9*	[1] 6		
[b] 244066	do	do	do	9.4	70.5	59.5	[a] 3.5	3.25	3.75	*86.7*	4.7	2.8	*59.6*	5.2	6.8	*130.8*
[c] 244079	do		50	8.9	72	54	3.45	3.18	3.6	*88.3*	4.3	2.8	*65.1*	5.2	7.1	*136.5*
225170	do	Washington	Senile	10.4				3.4	4.1	*82.9*	4.8	2.9	*60.4*			
248639	do	do	28	9	61.5	31	- 3.5	2.75	3.7	*74.3*	4.6	2.6	*56.5*	6.1	6.8	*111.5*
225226	do		70	9.8	66	49	3.6	[a] 3.3	3.8	*86.8*	4.85	2.7	*55.7*	6.1	[1] 7.2	*118*
244060	do	Richmond	Adult	9.4	69.5	52.5	3.7	3.3	4	*82.5*	4.7	2.5	*53.2*	5.9		
248337	do	Washington	do	9.6	65	49.5		3.38	3.8	*88.9*	5.05	2.8	*55.5*	[1] 6.1	[1] 7.2	*118*
244088	do	Richmond	do	9.4	70	55		3.3	4	*82.5*	4.7	2.7	*57.4*			
244068	do	do	do	8.9	67	47	3.5	3.75	4.1	*91.5*	5.5	2.9	*52.7*	5.8	6.9	*119*
244065	do	do	45	9.8	64	51	4.1	3.45	4.2	*82.2*	5.35	2.9	*54.2*	6.2	7.2	*116.1*
248674	do	Washington	Adult	9.3	72	61.5	3.1	3.15	3.7	*85.1*	4.8	2.7	*56.2*	5.6	6.8	*121.4*
244074	do	do	55	9.5	70	50	[1] 3.3	3.2	3.5	*91.4*	5.2	2.4	*46.2*	5.6		
225108	do	Richmond	Adult	9	71.5	49	4	3.3	3.95	*83.5*	4.65	2.5	*53.8*	5.6	[1] 7	*125*
248646	do	Washington	35	9	67	53	3.3	3.45	3.85	*89.6*	4.6	2.2	*47.8*	5.6	5.3	*94.7*
324589	do	Havana, Cuba	Adult	9.4	78	60.5	2.7	2.9	3.65	*79.5*	4.4	2.4	*54.6*	5.2	6	*115.4*
244059	do	Richmond	do	9.2	65.5	39		3.15	4.1	*76.8*	4.5	2.9	*64.4*	6.2	[1] 6.9	*111.3*
248638	do	Washington	do	9.3	70	52.5	3.5	3.45	3.9	*88.5*	4.9	2.3	*46.9*	5.4	6.7	*124.1*
226125	do		do	9	68.5	40		2.95	3.95	*74.7*	4.9	2.8	*57.1*			
244067	do	Richmond	45	9.2	68	50.5	3.8	3.42	4	*85.5*	4.95	2.8	*56.6*	[1] 5.7	6.8	*119.3*
- 225151	do		Adult	8.8			3.2	3.55	3.95	*89.9*	4.6	2.7	*58.7*			
244072	do	Richmond	do	9.6	72.5	66	3.9	3.3	3.9	*84.6*	5.1	2.8	*54.9*	5.3	(6.8)	*(128.3)*
225257	do	Near Vicksburg, Miss.	About 75	9.4				3.2	4.02	*79.6*	4.6	2.9	*63*			
244085	do	Alabama	Adult	9.9	70	51		3.35	3.85	*87*	5.05	2.8	*55.5*	6.3	6.7	*106.4*

[a] As far as ascertainable. In many the body was seen before dissection.
[b] Premature occlusion of sagittal suture.
[c] Shallow retro-coronal bilateral depression.

NOTE.—For footnotes to reference figures see p. 123.

AMERICAN NEGRO CRANIA (FULL-BLOOD OR NEARLY SO)

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
225150	U. S. N. M.		Adult	18.7	14	13.7	*74.9*	*83.5*	15.47	1,335		7.2	13.2		*54.6*	10.7	10.1
[a] 326982	do	Near Manassas, Va.	do	18.7	14	13.8	*74.9*	*84.2*	15.50								[1] 10.3
248627	do	Washington	65	18.4	13.8	13.1	*75*	*81.4*	15.10	1,395			13				9.5
244069	do	do	Adult	18.1	13.6	13	*75.1*	*82.3*	14.90	1,420	[6] 11.7	7.4	13	*90*	*56.9*	10.5	9.6
262227	do	Richmond	do	[1] 18	13.6	13.6	*75.6*	*86.1*	15.07	1,380		6.6	13.2		*50*	11	10.4
224725	do	Washington	do	17.6	13.3	13.7	*75.6*	*89.*	14.87	1,315		6.9	13.2		*52.3*	10.5	10.1
244063	do	Richmond	60	18.6	14.1	13.2	*75.8*	*80.5*	15.30	1,330		6.3	(14.5)		*(43.4)*	11	10.7
244071	do	do	Adult	18.2	13.8	13.2	*75.8*	*82.5*	15.07	1,260		(7)	12.8		*(54.7)*		10.8
224724	do	Washington	do	18.4	14	12.4	*76.1*	*76.5*	14.93	1,370	[6] 12.1	7.6	13.4	*90.3*	*56.7*	10.8	10.1
244058	do	Richmond	do	18.8	14.3	13	*76.1*	*78.3*	15.37	1,455			13.4				10
244073	do	do	25-30	18.4	14	13.2	*76.1*	*81.5*	15.20	1,420		7.1	12.8		*55.5*	11.5	10.1
244083	do	Long Pt., Texas	Adult	19.6	15	13.4	*76.5*	*77.5*	16.00	1,365		7.6	14		*54.3*	11.8	11.2
222126	do	Southern United States	45	18.4	14.2	13.2	*77.2*	*81*	15.27	1,240		6.5	13.4		*48.5*	9.8	9.8
224714	do	Washington	Adult	18.2	14.2	13.3	*78*	*82.1*	15.23	1,275	[7] 12	7.2	13.8	87	*52.2*	10.5	10.3
248643	do	do	45									6.3	12.5		*50.4*	11.3	10.1
Totals				(37) 688.5	(38) 493.9	(34) 454	(36)	(34)	(38) 549.47	(35) 47,490	(13) 152.6	(33) 230.1	(36) 472.6	(11)	(30)	(33) 353	(40) 412
Averages				*18.61*	*13.72*	*13.35*	*73.7*	*82.4*	*15.25*	*1,357*	*11.74*	*6.97*	*13.13*	*90*	*53.2*	*10.7*	*10.3*
Minima				17.6	12.6	12.1	*67.2*	*72*	14.80	1,165	9.5	5.7	12.2	*77.9*	*46.7*	9.8	9.4
Maxima				19.8	15	14.4	*78*	*91.1*	16.00	1,550	12.9	7.9	14	*100*	*63.7*	11.8	11.2

NOTE.—For footnotes to reference figures see p. 123. For footnote to reference letter see p. 134.

AMERICAN NEGRO CRANIA (FULL-BLOOD OR NEARLY SO)—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle.	Alv. Angle	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{l}{b \times 100}\right)$
					°	°										
225150	U. S. N. M.		Adult	9.2	65.5	45.5	3.6	3.1	3.8	*81.6*	5.05	2.5	*49.5*	6.1		
248627	do	Washington	65	8.5				3.2	3.95	*81*	4.7	2.6	*55.3*			
244069	do	do	Adult	8.9	62	44.5	3.8	3.55	3.9	*91*	5.08	2.9	*57.1*	6	6.9	*115*
262227	do	Richmond	do	10.2	67	56.5		3.1	3.65	*84.9*	5	2.6	*52*	6	7	*116.7*
224725	do	Washington	do	9.4	67.5	53.5		3.2	3.75	*85.3*	4.9	2.3	*46.9*	5.8	7.2	*124.1*
244063	do	Richmond	60	9.5	70.5	44	3.1	3.4	4.05	*83.9*	4.4	3	*68.2*	6		
244071	do	do	Adult	9.5			3.8	3.55	3.9	*91*	5.18	2.7	*52.1*			
224724	do	Washington	do	9.1	64	46	3.6	3.7	3.95	*93.7*	5.05	2.5	*4.95*	5.8	6.6	*113.8*
244058	do	Richmond	do	9.2			3.2	3.8	4.15	*91.6*	5	2.7	*54*			
244073	do	do	25–30	9.7	60.5	44		3.35	3.8	*88.1*	4.5	2.5	*55.6*	6.2	6.3	*101.6*
244083	do	Long Pt., Texas	Adult	10	66.5	45		3.6	4.2	*85.7*	5.1	2.9	*56.9*	6.4	7.5	*117.2*
222126	do	Southern United States	45	8.6	70.5	50		3.55	3.8	*93.4*	4.6	2.6	*56.5*	5.7	6.5	*114*
224714	do	Washington	Adult	8.8	68.5	44	4	3.5	4.2	*83.3*	4.95	2.9	*58.6*	5.7	7	*122.8*
248643	do	do	45	10	63	51.5		3.2	3.9	*82*	4.05	2.5	*61.7*	6.3	7.3	*115.9*
Totals				(39) 365.2	(33)	(33)	(21) 81.25	(39) 130.38	(39) 152.32	(39)	(39) 189.46	(39) 104	(39)	(31) 181	(23) 170.4	(25)
Averages				*9.36*	*68*	*48.5*	*3.53*	*3.34*	*3.9*	*85.6*	*4.86*	*2.67*	*54.9*	*5.84*	*6.82*	*116.6*
Minima				8.5	60.5	31	2.7	2.75	3.5	*7.43*	4.05	2.2	*44.9*	5.2	5.3	*94.7*
Maxima				10.4	78	66	4.1	3.8	4.2	*93.7*	5.75	2.9	*68.2*	6.3	7.5	*136.5*

*NOTE.—For footnotes to reference figures see p. 123.

AMERICAN NEGRO CRANIA (FULL-BLOOD)

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*	*Mean Height Index*	Cranial Module	Capacity in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Basion-Alveol. Pt. (x)	Basion-Nasion (y)
• 244067	U. S. N. M.		Adult	(18.6)	(12)	(12.2)	(*64.5*)	(*79.7*)	14.27	1,130		6.6	11.9		*55.5*	10.2	9.8
244064	do	Richmond	21	17.1	12.3	13	*71.9*	*88.4*	14.13		10.1	6	11.9	*84.9*	*50.4*	9.7	9.5
244061	do	Washington	Adult	18	13	12.8	*72.2*	*82.6*	14.60	1,080		6.4	12.8		*50*	10.4	10.6
244080	do	do	55	17.8	13	12.7	*73*	*82.5*	14.50	1,110			12				10
225104	do	Yorktown, Va	Adult	18.2	13.3	12.1	*73.1*	*76.6*	14.53	1,210		6.3				9.6	9.2
244089	do	Richmond	do	16.8	12.4	12.5	*73.8*	*85.6*	13.90	1,130		6.2	11.6		*53.4*	9.2	8.9
244075	do	do	do	18.3	13.5	11.6	*73.8*	*73*	14.47	1,170			12.2				9.8
• 262231	do	do	do	[1] 18.2	[1] 13.5	[1] 12.7	*74.2*	*80.4*	14.80	[1] 1,270		6.4				10.6	10.1
178632	do	Colonial Beach, Va	do	17.9	13.3	12.5	*74.3*	*80.1*	14.57	1,220		6.8	13.7		*49.6*	9.7	9.6
262230	do	Richmond	do	17.5	13	13.1	*74.3*	*86.2*	14.53	1,255							9.4
244081	do	Washington	do	18.3	13.6	12	*74.3*	*75*	14.63	1,265							9.6
225111	do	Richmond	do	17.2	12.8	12.8	*74.4*	*85.3*	14.27	1,220		6.2	11.7		*53*	9.2	9.1
225476	do	Washington	Near adult	17.2	12.8	11.8	*74.4*	*78.7*	13.93	1,130		6.1	11.5		*53*	9.2	9.2
262232	do	Richmond	Adult	17.4	13	11.8	*74.7*	*77.6*	14.07	1,150			[1] 11.7				8.7
244070	do	do	do	18	13.5	12	*75*	*76*	14.50	1,285		6.2	12.2		*50.8*	10	8.7
225236	do	Near Vicksburg, Miss	do	18.2	13.8	11.9	*75.8*	*74.4*	14.63	1,365	[1] 10.9	6.6	13.5	*80.7*	*48.9*	10.8	9.6
225474	do	Washington	70	18.3	14.2	13.2	*77.6*	*81.5*	15.23	1,400			12.9				9.9
262228	do	Richmond	Adult	16.9	13.3	12.8	*78.7*	*84.8*	14.33	1,145		6.4	11.7		*54.7*	10	9.8
228025	do	Washington	do	16.3	[1] 13	12.6	*79.8*	*86.3*	13.97	1,165		6.6	12.6		*52.4*	10.1	9.1
262229	do	Richmond	do	16.4		12.5											[1] 9.6
Totals				(19) 334	(18) 237.3	(19) 236.4	(18)	(18)	(19) 273.86	(18) 21,700	(2) 21	(13) 82.8	(15) 183.9	(2)	(11)	(13) 128.7	(20) 190.2
Averages				*17.58*	*13.18*	*12.44*	*74.7*	*80.7*	*14.41*	*1,205*	*10.5*	*6.37*	*12.26*	*82.7*	*51.9*	*9.9*	*9.51*
Minima				16.3	12.3	11.6	*71.9*	*73*	13.90	1,080		6	11.5		*48.9*	9.2	8.7
Maxima				18.3	14.2	13.2	*79.8*	*88.4*	15.23	1,400		6.8	13.7		*55.5*	10.8	10.6

• Slight asymmetry.

NOTE.—For footnotes to reference figures see p. 123.

AMERICAN NEGRO CRANIA (FULL-BLOOD)—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Basion subnasal Pt.	Facial Angle °	Alv. Angle °	Lower Jaw, Height of Symphysis	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*	Palate, external Length (l)	Palate, external Breadth, maxim. (b)	*Palatal Index* $\left(\frac{b \times 100}{l}\right)$
• 244067	U. S. N. M.		Adult	8.8	67.5	46		3.4	3.9	*87.2*	4.6	2.9	*63*	5.5	6.9	*125.4*
244064	do	Richmond	21	8.6	70	48.5	3.05	3.2	3.75	*85.3*	4.35	2.45	*56.3*	5.3	6.3	*118.9*
244061	do	Washington	Adult	9.1	74	51.5		3.5	3.85	*90.9*	4.3	2.4	*55.8*	5.5	6.4	*116.4*
244080	do	do	55	9.2				3.4	3.6	*94.4*	4.5	3	*66.7*			
225104	do	Yorktown, Va	Adult	8.6	67	51		[2] 3.15	[2] 3.7	*85.1*	4.6	2.8	*60.9*	5.6		
244069	do	Richmond	do	8.1	67	51		3.12	3.4	*91.8*	4.25	2.3	*54.1*	5.1	5.7	*111.8*
244075	do	do	do	9.4				3.32	3.85	*86.2*	3.95	2.7	*68.4*			
• 262231	do	do	do											5.6		
178632	do	Colonial Beach, Va	do	8.8	69	53.5		3.45	4	*86.2*	5.2	2.8	*53.8*	5.3	6.4	*120.8*
262230	do	Richmond	do					[2] 3.2	[2] 3.6	*88.9*						
244081	do	Washington	do				3									
225111	do	Richmond	do	8	69.5	45		3.45	3.65	*94.5*	4.55	2.6	*57.2*	5.2	6.5	*125*
225476	do	Washington	Near adult	8.2	70.5	50		3.2	3.35	*95.5*	4.5	2.4	*53.3*	5	6.3	*126*
262232	do	Richmond	Adult													
244070	do	do	do	8	5.95	31	3.5	3.35	3.65	*91.8*	4.2	2.9	*69*	6	6.3	*105*
225236	do	Near Vicksburg, Miss	do	8.8	61.5	35.5	3.3	3.55	3.8	*93.4*	4.4	2.5	*56.8*	5.9	5.9	*100*
225474	do	Washington	70	8.9			2.9	3.3	4	*82.5*	4.5	2.5	*55.6*			
262228	do	Richmond	Adult	8.8	69.5	48.5		3.3	3.7	*89.2*	4.6	2.5	*54.4*	5.6	6	*107.1*
228025	do	Washington	do	8.4	62	42		3.6	3.9	*98.3*	4.3	2.1	*48.8*	5.6	6.6	*117.9*
262229	do	Richmond	do													
				(15)	(12)	(12)	(5)	(16)	(16)	(16)	(15)	(15)	(15)	(13)	(11)	(11)
Totals				129.7			15.75	53.49	59.7		66.8	38.85		71.2	69.3	
Averages				8.65	67.5	46.5	3.15	3.34	3.73	*89.6*	4.45	2.59	*58.2*	5.48	6.3	*115.5*
Minima				8	59.5	31	2.9	3.12	3.35	*82.5*	3.95	2.1	*48.8*	5	5.7	*100*
Maxima				9.4	74	53.5	3.5	3.6	4	*95.5*	5.2	3	*69*	6	6.9	*126*

• Badly weathered.

NOTE.—For footnotes to reference figures see p. 123.

Negro crania—Summary of measurements

MALE

	British East Africa	South Africa		West Africa	American Negro (U. S. A.) full-blood
		Miscellaneous	*Kaffir*		
Number of Skulls	(14)	(34)	(6)	(7)	(37)
Vault:					
Length	18.36	18.93	18.55	17.90	18.61
Breadth	13.36	13.54	13.82	13.40	13.72
Height	13.21	13.47	13.43	13.58	13.35
Cranial Index	*72.8*	*71.5*	*74.5*	*74.8*	*73.7*
Mean Height Index	*83.3*	*82.9*	*83*	*86.8*	*82.4*
Module	14.97	15.31	15.26	14.96	15.25
Capacity	1,401	[1] 1,400	1,402	1,360	1,357
Face:					
m-n Height	...	11.66	11.08	...	11.74
alv. pt.-n Height	7	6.96	6.55	6.71	6.97
Breadth	12.97	13.34	12.87	13.06	13.13
Facial Index:					
Total	...	*87.9*	*85.7*	...	*90*
Upper	*54.5*	*52.2*	*50.9*	*51.4*	*53.2*
Basion-alv. pt. length	10.13	10.44	10.17	10.57	10.70
Basion-nasion	10.08	10.40	9.93	10.27	10.30
Basion-subnasal pt.	8.90	9.37	9.13	9.33	9.36
Facial angle (degrees)	*69.5*	*70.5*	*69*	*69*	*68*
Alveolar angle (degrees)	*51*	*55.5*	*52.5*	*51*	*48.5*
Orbits:					
Height	3.30	3.32	3.13	3.26	3.34
Breadth	3.79	3.79	3.72	3.84	3.90
Index	*87.1*	*87.6*	*84.1*	*84.9*	*85.6*
Nose:					
Height	4.90	4.88	4.76	4.58	4.86
Breadth	2.70	2.82	2.66	2.77	2.67
Index	*55.1*	*57.8*	*55.9*	*60.5*	*54.9*
Dental Arch:					
Length	5.73	5.73	5.52	5.67	5.84
Breadth	6.51	6.70	6.27	6.62	6.82
Index	*111.9*	*116.9*	*113.6*	*114.2*	*116.6*
Lower Jaw: Height at Symphisis	...	3.58	3.47	...	3.53

FEMALE

	British East Africa	South Africa: Miscellaneous	South Africa: Kaffir	West Africa	American Negro (U. S. A.) full-blood
Number of Skulls	(28)	(26)	...	(7)	(19)
Vault:					
Length	17.71	17.86	...	16.94	17.58
Breadth	12.98	13.02	...	12.96	13.18
Height	12.49	13.02	...	12.74	12.44
Cranial Index	*73.3*	*72.9*	...	*76.5*	*74.7*
Mean Height Index	*81.5*	*84.3*	...	*86.7*	*80.7*
Module	14.38	14.63	...	14.04	14.41
Capacity	1,242	[1] 1,245	...	1,182	1,205
Face:					
m-n height	...	...	...	...	10.50
alv. pt.-n height	6.50	6.54	...	6.52	6.37
Breadth	12.46	12.44	...	12.33	12.26
Facial Index:					
Total	...	...	...	...	*82.7*
Upper	*51.7*	*52.6*	...	*52.9*	*51.9*
Basion-alv. pt. length	9.93	9.84	...	9.76	9.90
Basion-nasion	9.70	9.76	...	9.40	9.51
Basion-subnasal pt.	8.81	8.72	...	8.54	8.65
Facial angle (degrees)	*69.5*	*69.5*	...	*67*	*67.5*
Alveolar angle (degrees)	*51.5*	*52*	...	*49*	*46.5*
Orbits:					
Height	3.28	3.28	...	3.32	3.34
Breadth	3.72	3.62	...	3.73	3.37
Index	*88.3*	*90.6*	...	*89*	*89.6*
Nose:					
Height	4.62	4.56	...	4.61	4.45
Breadth	2.59	2.71	...	2.52	2.59
Index	*55.9*	*59.4*	...	*54.7*	*58.2*
Dental Arch:					
Length	5.41	5.57	...	5.38	5.48
Breadth	6.16	6.38	...	6.17	6.30
Index	*114.6*	*114.5*	...	*115.8*	*115.5*
Lower Jaw: Height at Symphisis	...	3.13	...	...	3.15

[1] Estimated.

NOTES ON THE NEGRO

The above data show two outstanding results. One is the close relation of the negro skulls from widely separated parts of Africa. The second is the practical identity to this day of the American with the African negroes.

All through, the material is characterized by a poor development in the males of the external sex characters of the skull, particularly supraorbital ridges. In many of the specimens the sex identification could only be reached with the help of the skeleton, or with that of the relation of cranial module to cranial capacity.[1]

Tendency to premature occlusion of the sagittal suture and consequent cranial deformation, especially scaphocephaly, necessitating the elimination of the specimen from anthropometric work is met with in all the groups, but is much more common in the American than in the African negro.

The west Africans appear to be less dolichocephalic and to have relatively a somewhat higher vault than the other groups; but the series is not large or comprehensive enough to permit of any definite conclusion.

The Afro-Americans differ from the Melanesian blacks in that:

The Afro-American skull is slightly broader, and relatively somewhat lower.

The facial as well as the alveolar protrusion (prognathism) in the Afro-Americans is somewhat more moderate, their nose is somewhat broader, the orbits (male) somewhat narrower.

The dental arch presents a higher index.

The lower jaw tends to be higher.

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[1] Amer. Journ. Phys. Anthrop., 1928, vol. 8, p. 249.

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